AWAY ALL BOATS:

A study of the evolution and development of amphibious warfare in the Pacific War

---

A thesis submitted in partial fulfilment of the requirements for the Degree

of Master of Arts in History

in the University of Canterbury

by Brian O'Sullivan

University of Canterbury

2008

Abstract

Amphibious operations are a topic central to the history of World War Two in the Pacific Theatre. The majority of research on this topic has been centred on the impact of American experiences and successes attributed to the development and evolution of amphibious warfare. The contributions of the United Kingdom and Japan to the development of amphibious warfare have been either overlooked or marginalized. This thesis will investigate the amphibious activities of all three powers both during and before the Pacific War, and seek to explain the importance of each nation's contribution to amphibious warfare. In addition, the thesis will demonstrate how in its highest forms amphibious operations became a fully fledged system of global force projection. The thesis will explain how each of these powers interpreted the legacy of the failure of the 1915 Gallipoli campaign both in the context of their own wartime experiences, and in their respective strategic worldviews. This interpretation is central to how each power prepared for amphibious operations in the next war. The importance of the geography of the Pacific Ocean to the evolution and development of amphibious warfare will be discussed, as will the advances in technology that allowed the creation of logistical systems to support these operations.

Acknowledgements

Throughout this project I have been fortunate to receive the support and generous assistance of many people. In particular I would like to thank the following people: my supervisors, Dr Kenneth Henshall, and Professor Peter Hempenstall, for their assistance, advice, and guidance in the production of this thesis; Dr Richard Holdaway for generously lending me material on the Royal Navy; Akira Takizawa for responding so quickly to my queries on Japanese Landing Craft; Dr Neville Bennett for his gift of books; my partner Katherine Bushman for providing both moral support and technology; Rick and Elaine Bushman for their generous gifts of books and primary source material; my sister Anna for her assistance in preparing the illustrations in this work; my family for their overall support; Mel Wright for her assistance with all my projects; Aaron McMillan for his willingness to listen; my fellow Masters students and the History Department for providing a friendly work environment; and numerous other persons who helped in some way that I have failed to mention. I am also grateful to the US Navy, the US Army, the Australian War Memorial, and the Imperial War museum for the use of photographs in the text. Naturally the responsibility for any errors in this work is mine, and mine alone.

Contents

Glossary

AWM	Australian War Memorial
BuShips	US Navy Bureau of Ships
Chi Ha	Japanese Type 97 Medium Tank
COHQ	Combined Operations Head Quarters (UK)
Daihatsu	Japanese Type 'A' Landing Craft
Dukw	(pronounced 'Duck') US amphibian truck
FLEX	Fleet Landing Exercise (US Navy)
FMF	Fleet Marine Force
FMFRP	Fleet Marine Force Reference Publication
FTP	Fleet Training Publication (US Navy)
HAF	Historical Amphibious File (US Marines)
ISTDC	Inter Service Training Development Centre (UK)
IWM	Imperial War Museum (UK)
Ka-Chi	Japanese Type 3 amphibious Tank
Ku-Mi	Japanese Type 2 Amphibious Tank
LCA	Landing Craft Assault
LCM	Landing Craft Mechanised
LCP(L)	Landing Craft Personnel Large
LCP(R)	Landing Craft Personnel Ramped
LCT	Landing Craft Tank
LCV	Landing Craft Vehicle
LF	Landing Force
LSD	Landing Ship Dock
LSI	Landing Ship Infantry
LSI(L)	Landing Craft Infantry, Large
LSM	Landing Ship Medium
LST	Landing Ship Tank
LVT	Landing Vehicle Tracked
MLC	Motor Landing Craft (UK)
ONI	Office of Naval Intelligence (US Navy)
POA	Pacific Ocean Area
RAAF	Royal Australian Air Force
RAF	Royal Air Force (UK)
RAN	Royal Australian Navy
Rikusentai	Naval Landing Party (Japan)
RN	Royal Navy (UK)
SNLP	Special Naval Landing Party (Japan)
Suki	Japanese amphibian truck
SWPA	South Western Pacific Area
USMC	United States Marine Corps
Yusokan	Class of Japanese Landing Ship, with a superficial resemblance to Allied LCT

Chapter One Introduction

This study will attempt to answer how by the end of the war in the Pacific amphibious warfare developed from a military impossibility, to a fully fledged system of force projection. Mastery of the art of amphibious warfare was one of the major factors that allowed the United States and its allies to defeat the Japanese Empire during World War Two. By 1945 the United States had developed the ability to project and sustain military force into virtually any coastal area in the world. Before the war such capability would have been considered impossible in the wake of the failed Dardanelles campaign, due to advances in defensive firepower and the rise of modern airpower.[1]

Amphibious warfare underwent a transformation during World War Two. In 1939 Liddell Hart, a noted British military theorist, would describe amphibious operations as being "almost impossible, because of the vulnerable target which a convoy of transports offers to the defenders' air force. Even more vulnerable is the process of disembarkation in open boats".[2] Yet, after major successful amphibious operations had been conducted during the war, Liddell Hart would write in 1960 that "[a]mphibious flexibility is the greatest strategic asset that a sea power possesses".[3]

The purpose of this study is to examine not just the development of amphibious warfare, but to also demonstrate how, during the Pacific War, it evolved into a 'higher form' of operation. This change

[1] S. E. Morrison, *The Two-Ocean War: A Short History of the United States In The Second World War*, Boston, 1963, p.15.
[2] cited in J. H. Alexander, "Across the Reef: Amphibious warfare in the Pacific" in *The Pacific War: From Pearl Harbor to Hiroshima*, Oxford, 2006, p.198.
[3] cited in N. Polmar, and P. B. Mersky, *Amphibious Warfare: An Illustrated History*, London, 1988, p.6.

resulted in the creation of amphibious taskforces capable of providing their own air and naval gunfire support, and operating vast distances from their home base of operations. These taskforces were used in the Pacific by the United States to perform what writer Joseph H. Alexander called 'Storm Landings'. Alexander defines these as being "risky, long-range, large-scale, self-sustaining assaults executed against strong opposition and within the protective umbrella of fast carrier forces."[4] While Alexander is writing about operations in the Pacific, such as Operation Galvanic,[5] his words could just as easily be applied to another taskforce operating a vast distance from its home port, that which the British Royal Navy used in Operation Corporate during the Falklands War (April 2nd to June 14th 1982). Operating a vast distance form the United Kingdom, or other friendly ports, the taskforce had to supply its own airpower protection, in addition to supplying air and naval gunfire support to operations conducted ashore. It is this type of taskforce which clearly demonstrates the modern evolved form of amphibious warfare today, and which can trace its genesis back to the Pacific War.

Amphibious warfare

Amphibious warfare can be defined as the projection of military force from the sea, onto a hostile or potentially hostile shore.[6] While the term 'projection' can have many uses, it is the physical projection of military power that is important in this definition. The United States Navy, one of the great practitioners of the art of amphibious warfare, defines it as being "a military operation

[4] J. H. Alexander, *Storm Landings: Epic Amphibious Battles in the Central Pacific*, Annapolis, 1997, p. xiii.
[5] The 2nd US Marine Division journeyed approximately 2000 miles from its base in Wellington, New Zealand, to its target Betio Island in the Tarawa Atoll chain, present day Kiribati. See Fig. 3.
[6] I. Speller, and C. Tuck, *Strategy and Tactics: Amphibious Warfare*, Staplehurst, 2001, p.7.

launched from the sea by an amphibious force, embarked in ships or craft with the primary purpose of introducing a landing force (LF) ashore to accomplish the assigned mission".[7] British practice is to use the terminology of 'combined operations' to describe amphibious operations, as they require the combined efforts of more than one arm of the service.

In fact amphibious warfare has a history stretching back into antiquity. Records from the Egyptian Empire, dating to around 1200 B.C,[8] show that coastal provinces were experiencing attacks from raiders based in the Mediterranean islands and southern Europe. Homer's *Iliad* [9] describes a war between the kingdoms of Greece and the city of Troy, which is in effect the story of an amphibious campaign. It starts with the initial Greek landings and assault on Troy, and later the feigned withdrawal used by the Greeks to lull the Trojans into taking a certain wooden horse into their city. Thucydides in his *History of the Peloponnesian War*[10] describes many amphibious operations conducted throughout the war, most notably the various campaigns conducted in Sicily.

This long, ongoing, tradition of amphibious warfare is not surprising given that 70.8% of the planet's surface is water.[11] Thus the ability to project military force across water onto a hostile shore is particularly useful. It is also an ability often developed out of geographical necessity. As Napoleon remarked "the policy of a

[7] US Navy, *Joint Publication 3-02 Joint Doctrine for Amphibious Operations*, Washington, 2001, p.18.
[8] Speller and Tuck, p.8.
[9] Homer, *The Iliad*, London, 1997.
[10] Thucydides, *History Of The Peloponnesian War*, London, 1972.
[11] Anon., *The Times World Atlas*, London, 2005, p.44.

state is in its geography. The forms in which policy is expressed are diplomacy and war".[12]

Amphibious operations in warfare are 'amphibious' in the broadest possible sense, whereas when equipment is termed 'amphibian' it is meant in the literal sense of being able to operate on both land and water. Military forces used in amphibious operations are not required to be amphibian in nature (although this is an advantage); they merely require the ability to land from the sea onto a hostile, or potentially hostile, shore. It is this element of risk which distinguishes it from a transport operation, which merely carries troops from friendly shore to friendly shore, along sea lanes of communications, whose security may, or may not, be guaranteed by friendly forces.

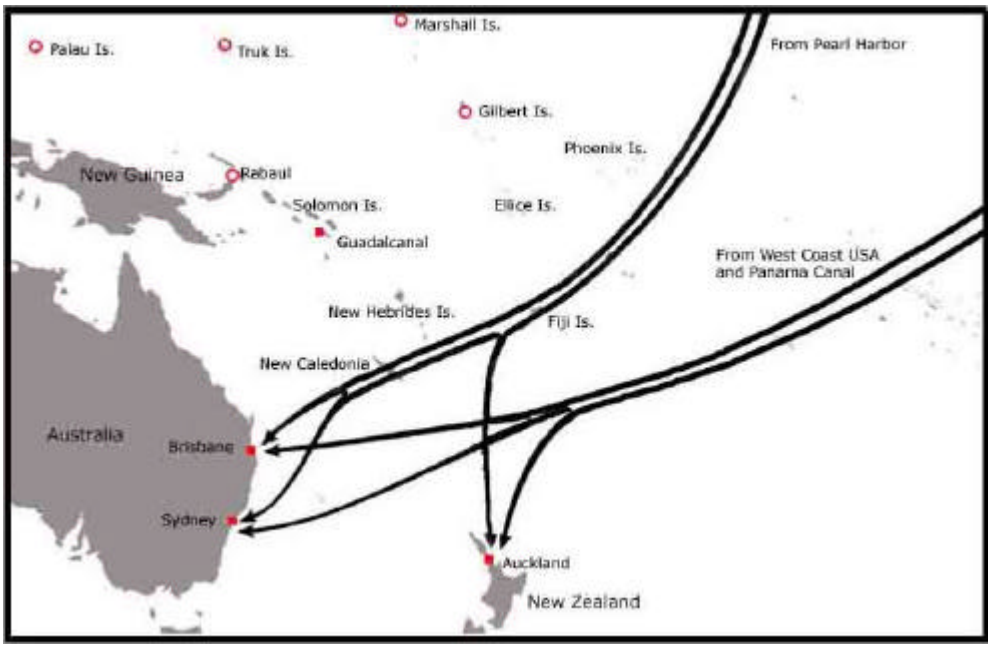


Figure 1. TRANSPORT OPERATION US Sea Lanes of Communication South and Southwest Pacific, July 1943.

[12]cited in C. Falls, "Geography and War Strategy", *The Geographical Journal*, Vol. 112, No. 1/3, Jul.-Sep., 1948, p.10.

Also, it is this physical projection of force onto the shore that distinguishes it from littoral warfare.[13] To paraphrase Lord Nelson, a ship may be a fool to attack a fort, but unless it lands forces on the shore, it is not an amphibious operation.[14] The bombardment of a coastal fort by a warship is the projection of naval power ashore allowing it to dominate a coastal territory by virtue of the destructive power of its armament, as occurred during the Japanese bombardment of Henderson Field (see Figure 2). This domination lasts only as long as the naval force remains to continue the bombardment. Without the physical projection of force ashore, a territory cannot be occupied. Naval ordnance can dominate a coastal territory, but only a landing party can hold, and thus control it.

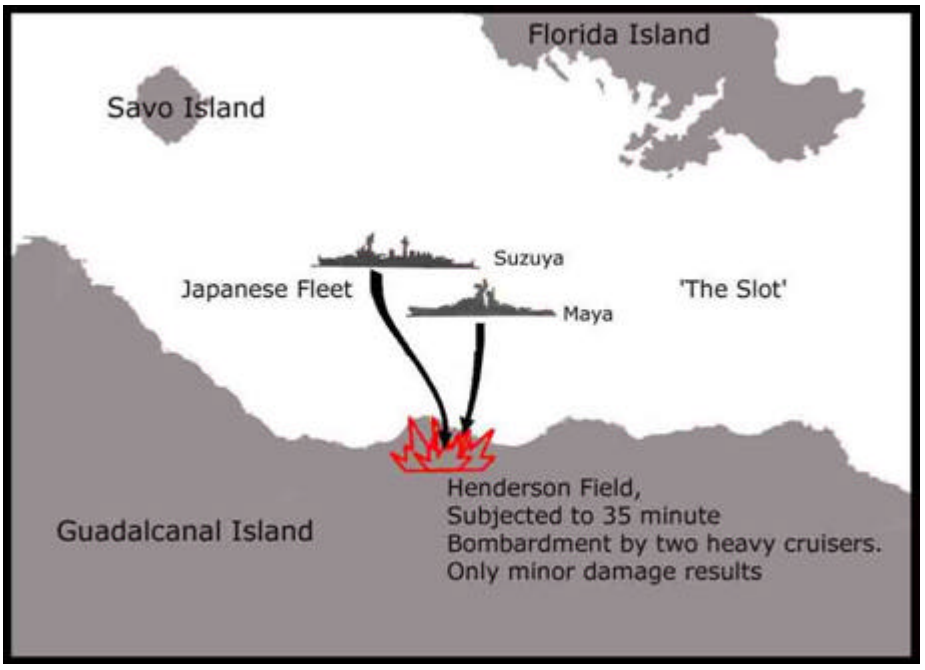


Figure 2. LITTORAL OPERATION. Night of 13/14 November 1942, Japanese Bombardment of Henderson Field, Solomon Islands.

[13] Littoral warfare is naval operations in coastal waters, the littorals.

[14] "A ship's a fool to fight a fort" A maxim of naval strategy traditionally attributed to Lord Horatio Nelson, cited in F. O. Hough, V. E. Ludwig, and H. I. Shaw, *Pearl Harbor to Guadalcanal: History of Marine Corps Operations in World War II Vol. 1* , Washington, n.d., p.16.

These two factors, the element of risk, and the physical projection of military power ashore, are the defining characteristics of amphibious operations. While both transport and littoral operations are important, they both lack these defining characteristics. However, the complementary value of these types of operation should not be overlooked. During the Pacific War, it was a series of transport operations that moved American troops and material from the United States to Allied ports throughout the Pacific. The arrival of these troops contributed greatly to the Allied victory, and while their passage across the Pacific Ocean was not without risk of attack from Japanese submarines, the moving from friendly port to friendly port constituted a transport operation. While the journey was potentially risky, the nodal points of departure and arrival were safely in Allied hands.

During the Pacific War many of the campaigns centred round the control of various strategically placed island groups to act as naval and air bases. Owing to the vast size of the Pacific, and the technical limitations of both ships and aircraft in the early twentieth century, control of these islands could determine the success of future operations. Both the Allies and the Japanese devoted considerable effort and resources towards developing their respective amphibious forces. This was due to the obvious benefits these forces would have in projecting power across the vast

expanses of the Pacific Ocean.

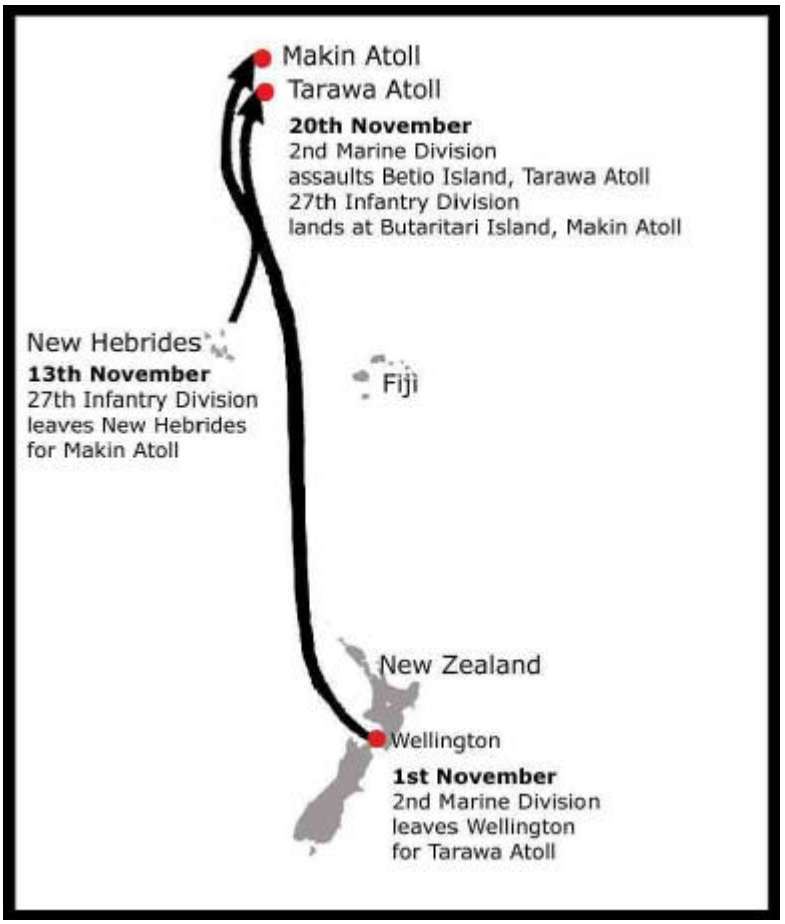


Figure 3. AMPHIBIOUS OPERATION. November 1943, Operation Galvanic.

Methodology

This study will attempt to take a transnational[15] approach to examining the development of amphibious warfare in order to better explain the development of amphibious equipment and doctrine. Many of the respective technical and doctrinal solutions to the problems posed by amphibious warfare were quite similar. This was the result of four main factors: separate parallel development, cooperation and liaison in the interwar period, imitation of captured equipment and material, and finally espionage. By taking this

[15] The usage of the term 'transnational' in this thesis is that of looking at more than one nation, rather that the wider meanings often employed by other scholars.

approach, rather than focusing on one nation, the importance of each nation's contribution can be assessed more fully.

The three powers examined in this study are Japan, the United Kingdom, and the United States of America. Both Japan and the United Kingdom are island nations. For either of them to wage war on its neighbours (or other nations) they had to develop at least a rudimentary ability to conduct amphibious operations. The United States of America by contrast is a large landmass, rich in both natural resources and territory. However, the Americas are bounded on both sides by vast oceans. In order to project military power onto Europe, Asia, or Africa, it too must possess the ability to conduct amphibious operations. As a result all three powers have a tradition of conducting amphibious operations, and had conducted major amphibious operations during the fifty years prior to the beginning of the Pacific War.

The selection of these three powers as the primary focus of this study is due to the fact that at the beginning of World War Two, these nations were the three largest naval powers. This study will examine the approaches each of these three major powers had towards the development and practice of amphibious warfare during World War Two. The focus on the geographical area of the Pacific is due to its being the largest ocean; the sheer number of amphibious operations conducted in it during World War Two, and because it was the theatre in which all three of the powers directly interacted.

The structure of this study will be based on five chapters. This introduction will serve to outline the purpose of the study as a whole. The second chapter of this study will briefly provide an

overview of the period 1759 –1914 and demonstrate the impact that the new technologies of the nineteenth century had on amphibious warfare. In order to properly explain the development of amphibious warfare during the Pacific War, it is also necessary to briefly examine the development of amphibious warfare during the period 1914-1918.

By examining the period, it will be demonstrated that even before the ill-fated 1915-1916 Dardanelles campaign, amphibious operations had been viewed as risky operations in both military and political circles, and that they had often failed just as spectacularly. Indeed, at the beginning of the twentieth century some theorists were beginning to believe that the improvements in defensive firepower bought about by the introduction of the magazine feed rifle, the machine gun, and quick firing artillery "appeared to make opposed landings at best hazardous, and at worst impossible".[16] Events in the Dardanelles would offer evidence to reinforce this theory, even as other operations in World War One would show that properly planned and resourced operations could succeed.

The third chapter of this study will seek to demonstrate the reactions of all three powers to the lessons of World War One, and will examine in detail the technical and doctrinal developments made by each power during the interwar period. Amphibious operations and exercises conducted during this timeframe will also be closely examined as a number of technological and doctrinal innovations were developed during this period, both in readiness for future conflicts, or for use in current conflicts.

[16] Speller and Tuck, p.10.

An investigation into the development of amphibian[17] vehicles, purpose built landing craft, and other specialised equipment will occur in the fourth chapter. The chapter will also explain how these equipments became the genesis of the modern types in use since 1945. The relative importance of doctrinal needs versus operational experience in the design process will be shown, as will the contributions each power made towards the development of modern amphibious equipment.

The final chapter will examine amphibious operations conducted by all three powers in the Pacific and how they shaped the evolution and development of amphibious warfare. The impact of operations in other theatres and the logistical challenges posed by the Pacific will be explored as will the exchange of information, ideas, and equipment between allies, theatres, and even opposing powers. This chapter will show how the lessons learnt in both preparing for, and in conducting amphibious operations in the Pacific shaped the development of amphibious warfare as we know it today.

Literature review

The only work found by the author to be taking a similar transnational approach to the development of amphibious warfare is a chapter by Millett in the book *Military Innovation in the Interwar Period*.[18] While a detailed and informative study, it is limited by its concentration on the interwar and early war periods and its reliance on mainly secondary sources, albeit highly regarded secondary sources. Another work taking a transnational approach is Clifford's *Amphibious Warfare Development in Britain and America from*

[17] As described earlier, vehicles able to fully function both in water and on land.
[18] A. R. Millett, "Assault From The Sea: The development of amphibious warfare between the wars – the American, British, and Japanese experiences" in *Military Innovation in the Interwar Period,* New York, 2005, pp. 50-95.

1920-1940.[19] Clifford argues that the British and Americans developed in parallel two separate systems of amphibious doctrine, resulting in two systems in which each "fundamentally was identical to the other."[20] Clifford consulted extensive British archival material during his study, and gives a picture of a Britain poorly prepared to conduct amphibious operations and largely unconvinced of their necessity in a future European war. This contrasts badly with the American developments of both a functional doctrine and of a future wartime role during the same period.

The key reference for any study of US amphibious operations in the Pacific War remains Isely and Crowl's 1951 study, *The US Marines and Amphibious War*.[21] Both authors worked on the official US Marine history of World War Two. This study goes further than the official history in its analysis of amphibious operations. The study was the result of a joint project between Princeton University and the US Marines. Complete access was granted to both records and personnel. The only omissions in the work were material withheld for reasons of national security. Fortunately this did not affect the conclusions of the study. These were that the success of the US Marines was a result of their prewar doctrinal development that was perfected as a result of wartime experience. This work remains as one of the best works available on US Marine operations in the Pacific War. It is however naturally limited by its sole focus of American efforts during the war.

[19] K. J. Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, Laurens, 1983.
[20] Clifford, p. 250.
[21] J. A. Isely and P. A. Crowl, *The U.S. Marines And Amphibious War: Its Theory, and Its Practise In The Pacific*, Princeton, 1951.

Vice Admiral Dyer's two volume work *The Amphibians came to conquer*[22] is the story of US Navy Admiral Kelly Turner's important role in both the development of amphibious doctrine, and in the successful execution of wartime amphibious operations. The production of this work is the result of the US Navy's deliberate attempt to have senior officers record their experiences and contributions to the war effort. Dyer gives a detailed analysis and explanation of both Kelly's and the navy's role in wartime amphibious operations. Turner did play an important role in the development of amphibious warfare and this is reflected in this work which is based not only on Turner's recollections but on Dyer's research in US navy archives.

US Marine General Holland 'Howling Mad' Smith's biography *Coral and Brass*,[23] co-written by Percy Finch, gives an account of Smith's role in the development, and conduct, of amphibious operations by United States forces in the Pacific. General Smith's role in the prewar development of amphibious doctrine is also covered. More interestingly is his controversial view that "Tarawa was a mistake".[24] This postwar viewpoint appears to belong to Smith alone, as, according to Alexander, every other high ranking officer involved in Operation Galvanic spoke out against his assertion.[25] While General Smith uses his memoirs to defend his wartime actions, they still provide a useful and important resource in telling the story of the US Marines' role in developing US amphibious doctrine, particularly during the interwar period.

---

[22] G. C. Dyer, FMFRP 12-109-I *The Amphibians Came To Conquer Vol. I*, and FMFRP 12-109-II *The Amphibians Came To Conquer Vol. II*, Washington, 1991.
[23] H.M. Smith and P. Finch, *Coral and Brass*, New York, 1949
[24] Smith and Finch, p. 134.
[25] J. H. Alexander, *Utmost Savagery: The Three Days of Tarawa*, Annapolis, 1995, p.243.

Lorelli's *To Foreign Shores*[26] is a study that encompasses all American amphibious operations in World War Two. Lorelli covers these operations in depth, but does little analysis of the prewar development of doctrine or equipment. Lorelli's work is valuable as it is the only work to cover all American amphibious operations in World War Two and the interrelationship between the various theatres.

Joseph Alexander's *Storm Landings. Epic Amphibious Battles In The Central Pacific*[27] details several US Marine operations in the Pacific in order to illustrate the development of a new class of amphibious operation postulated by Alexander. This class was the 'Storm Landing'. This thesis follows in part Alexander's theory that this class of operation developed during the Pacific War and formed the blueprint for modern operations.

Singapore: The Japanese Version[28] by Colonel Masanobu Tsuji, former chief of operations and planning staff for the 25th Japanese Army during the Malayan Campaign, is one of a small number of Japanese accounts that have been translated into English. Tsuji provides a through account of the campaign, though at times perhaps overstating his personal role in the success of the campaign. Nevertheless, Tsuji's role was an important one, and he was well placed to be aware of many factors affecting the Japanese operations. Also of great value is the inclusion of an English translation of the wartime Japanese pamphlet *Read This and the War is Won*. This pamphlet gives a great deal of information on Japanese amphibious procedures and on the official justifications for the conflict.

---

[26] J. A. Lorelli, *To Foreign Shores*, Annapolis, 1995.
[27] J. H. Alexander, *Storm Landings: Epic Amphibious Battles in the Central Pacific*, Annapolis, 1997.
[28] M. Tsuji, *Singapore: The Japanese Version*, London, 1966.

Another Japanese memoir is *Samurai*[29] written by Saburo Sakai. Sakai was the highest scoring Japanese Navy fighter pilot to survive the war and provides an enthralling account of his experiences during the war, as the Japanese Empire moves from early victories to defeat. Of special interest to this study is his description of his unit's efforts to maximise the range of their aircraft for the attack on the Philippines. This account is a useful source for any researcher interested in Japanese naval aviation during the Pacific War. Given the importance the Japanese attached to air support of amphibious operations, Sakai's inside view of the culture of the Japanese Navy air arm, and its relations with both the Imperial Army and other branches of the navy, reveals how poor those relations could be.

Evans and Peattie in their work *Kaigun Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941*,[30] give a detailed examination of Japanese amphibious developments and operations from the late nineteenth century to Pearl Harbor. It also details the growing prominence of Japan's army in the realm of amphibious development during this period.

Two major schools of thought exist as to the state of Japan's amphibious preparedness on the eve of the Pacific War. The first, typified by Von Lehmann in his essay, *Japanese Landing Operations in World War Two*,[31] argues that Japan had the best amphibious doctrine in the world as a result of extensive combat

[29] S. Sakai, M. Caidin, and F. Saito, *Samurai*, London, 1960.
[30] D. C. Evans, and M. R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941*, Annapolis, 1997.
[31] H. G. Von Lehmann, "Japanese Landing Operations in World War Two", in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, pp. 195-201.

operations against China. The second school, typified by Drea in *The Development of Imperial Japanese Army Amphibious Warfare Doctrine*,[32] believes that Japanese amphibious doctrine contained a fatal flaw in that it was not designed to conduct assault landings against determined opposition. Both sides of this debate have merit, as while the Japanese did conduct successful landings in the face of serious opposition such as at Koto Bharu, Malaya, in 1941, they also were repelled in their first attempt to take Wake Island.

The present author has been unable to find any works detailing both Allied and Japanese amphibious equipment used during the Pacific War. The closest is *Conway's All The World's Fighting Ships 1922-1946.*[33] This work, while containing technical information on larger amphibious vessels contains little in the way of information on landing craft. The lack of a unitary work describing the landing craft of all three powers can cause the Japanese contributions to the development of the modern form of landing craft to be easily overlooked.

Norman Friedman's *U.S. Amphibious Ships And Craft: An Illustrated Design History*[34] is a superbly illustrated study of the development of US landing craft. This work details the impact of both British and Japanese designs on the creation of US craft, as well as wartime experience into the design of current US amphibious forces. Jerry Strahan's *Andrew Jackson Higgins And*

[32] E. J. Drea, "The Development of Imperial Japanese Army Amphibious Warfare Doctrine", in *In the Service of the Emperor: Essays on the Imperial Japanese Army*, Lincoln, 1998, pp. 14-25.
[33] R. Gardiner, (editor), *Conway's All The World's Fighting Ships 1922-1946*, London, 1980.
[34] N. Friedman, *U.S Amphibious Ships and Craft: An Illustrated Design History*, Annapolis, 2002.

The Boats That Won World War II[35] is a well researched study that details the role of Higgins in both designing US craft, but also in creating them in the numbers required by the demands of war. Naturally, its focus remains on the production of landing craft rather than their employment.

Arms and Armour's *Allied Landing Craft of World War Two* ,[36] a reprint of the wartime ONI[37] publication, provides details on all Allied landing craft and ships, including those based on local Australian patterns. Designed as a planning and information guide for Allied staffs, it contains an illustration and technical data on every major piece of amphibious equipment used by Allied forces in World War Two.

Merriam Press's *Japanese Landing Craft of World War II*[38] is based on the report of the post-war US Naval Technical Mission to Japan. However, it suffers from poor quality reproductions of diagrams and photographs of equipment mentioned. Fortunately, the high quality of diagrams, photographs, and illustrations contained in reproductions of *ONI 225-J Japanese Landing Operations and Equipments*[39] more than make up for this shortcoming. Ideally, both should be consulted together as the postwar report acts as a control for the wartime report. Both of these works are of value to this study as accurate information on Japanese amphibious equipment is difficult to obtain in English.

---

[35] J. E. Strahan, *Andrew Jackson Higgins and the Boats that won World War II*, Baton Rouge, 1994.
[36] A. D. Baker, *Allied Landing Craft of World War Two*, London, 1985. reprint of US Navy, *ONI 226 Allied Landing Craft and Ships*, Washington, 1944.
[37] Office of Naval Intelligence.
[38] R. Merriam, *Japanese Landing Craft of World War II: U.S. Naval Technical Mission to Japan*, Bannington, 2006.
[39] US Navy, *ONI 225 J Japanese Landing operations and equipment*, Washington, 1943.

Of works dealing principally with amphibious warfare, four works stand out for consideration. First is Bernard Fergusson's *The Watery Maze: The Story of Combined Operations*,[40] which details the development of British amphibious warfare from the interwar period through to the Suez Crisis. This work provides an excellent overview of British amphibious operations in the first half of the twentieth century. While Polmar and Mersky's *Amphibious Warfare. An Illustrated History*[41] gives an Americo-centric view of the development of amphibious warfare paying particular weight to the American role in the development of modern amphibious operations, particularly the category of vertical assaults.

Speller and Tucker's *Strategy and Tactics Amphibious Warfare The Theory And Practice Of Amphibious Operations In The 20th Century*[42] attempts to explain and define amphibious operations using a variety of case studies. This results in a series of quite robust definitions and is thus a valuable reference for any study of amphibious warfare.

The final work is *Assault From The Sea: Essays on the History of Amphibious Warfare*.[43] This useful collection of essays ranges from the Battle of Marathon (490 B.C.), through to the Falklands War. A study wide ranging in scope, it encompasses work written by respected military historians and profession naval officers. This author in the preparation of this thesis has consulted many of these essays.

Sources

[40] B. Ferguson, *The Watery Maze: The Story of Combined Operations*, London, 1961.
[41] N. Polmar, and P. Mersky, *Amphibious Warfare: An Illustrated History*, London, 1988.
[42] I. Speller, and C. Tuck, *Strategy and Tactics: Amphibious Warfare*, Staplehurst, 2001.
[43] M. L. Bartlett, (editor), *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993.

The Pacific War was an extremely well documented conflict, providing a wealth of archival material to future researchers. Material is maintained in the archives of all the combatant powers. By far the biggest archives are those of the United States military. This is a result of three main factors: deliberate documentation, material generated by daily activity, and the acquisition of captured material.

The US military went to great lengths to document its involvement in World War Two. This was achieved by sending historians, journalists, and camera crews into the field to record events. The resulting material includes films, photographs, monographs, transcripts of after action interviews, and such classic accounts of the Pacific War as Sherrod's *Tarawa* [44] give a vivid eyewitness account of the chaos and carnage of an amphibious assault.

The various service and campaign histories produced by the United States military are generally well written, and attempt to be objective in their interpretation of events. This is due in part to the quality of the authors, and partly due to the desire of the US military to create histories that would not only tell the story of its armed forces in the conflict, but also act as a learning tool for future generations of service personnel. In order to achieve this, historians were recruited during the war and literally sent into the field to record operations. These historians had access to service personnel of all ranks, and would commonly conduct after action interviews of units in order to ascertain what had occurred. These interviews, coupled with more formal reports complied by various unit headquarters, would allow the creation of accurate monographs and official histories which would be both well written

[44] R. Sherrod, *Tarawa: The Story of a Battle*, Fredericksburg, 1985.

and informative. For an excellent overview of this process see James MacGregor's article *The Naked Truth of Battle*.[45]

Of all the US Military archives, the US Marine archive is the most useful to any study of amphibious warfare in the Pacific. This is because the archive holds the Historical Amphibious File collection.[46] This contains a vast range of material including plans for landing craft, photographs and intelligence summaries. The collection contains historical documents relating to amphibious operations conducted by other powers and is an important source for any student of amphibious warfare. This study has drawn heavily on material from this archive, as it is both one of the most comprehensive and freely accessible collections of primary sources available on amphibious warfare.

In contrast are the difficulties faced in obtaining primary source material on British amphibious development. Very little British material is available online, and it is all subject to Crown copyright. This means that the reproduction of British primary source material for private sale to collectors and researchers alike is rare, unlike that for American material in which there exists a large industry. To obtain the material requires the researcher to travel to Britain, and visit archives that are often lacking even electronic indexes. This thesis depends for much of its research on the British aspect of amphibious development on secondary sources based on research in British archives.

[45] J. MacGregor, "The Naked Truth of Battle", *Military Affairs*, Vol. 11, No. 4, Winter, 1947, pp. 223-228.
[46] http://www.mcu.usmc.mil/MCRCweb/archive/ (the address for the search engine is http://12.1.239.226/isyspeq.html).

While much material on Japanese operations during the war was destroyed, both as a result of Allied military action and deliberately by the Imperial Government after the surrender before Allied occupation forces arrived, significant Japanese material did survive. Generally this was documentation captured in the field such as can be found in the US Marine archives. In addition, General MacArthur's occupation government created a series of monographs in the immediate post-war period detailing Japanese operations and equipment. These reports were produced as a result of interrogations of Japanese personnel, assessment and testing of equipment, and the examination of surviving documentation.

The value of the Internet to researchers in this period is immense. Sites maintained by the US military allowing researchers to freely download material and search online have made serious research in this period accessible to any individual with an internet connection.

A growing trend, spearheaded by the US military, is for the official histories of the period to be made freely available through governmental websites. Currently, the official US Marine[47] and US Air Force Histories[48] are available in downloadable pdf format. The exception to this is the US Navy histories, which, due to copyright concerns, cannot be so treated.[49] In addition, the official history websites of all four US services have many other primary source materials available for use in either pdf or html format. The Hyperwar site is especially useful for researchers as it has many

[47] http://www.usmc.mil/directiv.nsf/HISTORICAL?openview&count=5000&start=1
[48] https://www.airforcehistory.hq.af.mil/publications.htm
[49] Works created by US Federal employees are automatically released into the public domain. As S. E. Morison was not a Federal employee at the time he wrote the US Navy histories, he retains the copyright of his work.

US Navy manuals pertaining to amphibious warfare available in html format on its site.[50]

The Australian government, through the Australian War Memorial website,[51] has also made its official histories available in pdf format, while the New Zealand Government has its official history available in html format.[52] Pdf versions are available of the New Zealand Histories, but must be ordered and paid for. This policy is in direct contrast to the approach taken by both the United States and Australian governments. As pdf versions of documents are of greater value to the researcher, due to the greater accuracy in production, this policy is unusual to say the least. The Australian War Memorial site is also home to the Australia-Japan Research Project which will be continuing its efforts to translate Japanese material into English. Given the difficulties of translation, and the value of Japanese sources to any serious researcher of the Pacific War, having the material freely available is tremendously valuable.

By far the best resource on the internet for information on the Imperial Japanese Army is the website maintained by Taki.[53] Taki is the pseudonym used by Akira Takizawa, a Japanese historian who specialises in the study of the Japanese Imperial Army. Taki's site is extremely well presented with a huge collection of wartime photos of Japanese equipment including landing craft and amphibious vehicles. The site is based on a variety of Japanese sources, most of which have not been widely translated into English. The result is a site that provides statistical information on a variety of equipment types used by the Imperial Army. This data

[50] http://www.ibiblio.org/hyperwar/
[51] http://www.awm.gov.au
[52] http://www.nzetc.org/tm/scholarly/subject-000004.html
[53] http;//www3.plala.or.jp/takihome

includes production figures, technical details, and date of entry into service. Taki is able to use Japanese sources to point out the shortcomings in English language reference material, which are often caused by poor translation.

Chapter Two From Quebec to 'Albion'

After Gallipoli it became widely believed by many observers that opposed landings had become outmoded in the face of magazine fed bolt action rifles, machine guns, quick firing artillery, and the improvements in communications brought about by railways and the telegraph. The view was that these improvements had given a decisive advantage to the defender over any possible attack from the sea. This ignores the fact that technological advances throughout the nineteenth century had also improved the striking power of amphibious forces, and that amphibious operations had faced considerable disadvantages since before the beginning of the eighteenth century.

This chapter will seek to place the ill fated 1915 Gallipoli landings in a wider historical context, demonstrating that far from being an isolated failure, amphibious operations had always been risky affairs with a high proportion of failures.[54] This chapter will also seek to demonstrate that on the eve of World War One technological developments had resulted in the production of the modern battleship, a near perfect platform for the naval gunfire support of amphibious operations. The Allied failure at Gallipoli will be placed in the wider context of amphibious operations conducted during World War One, and it will be demonstrated that its failure was the result of factors that had resulted in failure for other expeditions, rather that any special circumstances resulting from the technological developments occurring in the nineteenth century.

[54] This view is in direct opposition to N. Polmar and P. Mersky's view that "In general, troops landed from ships were successful in overcoming opposition. The doctrine which held that assault from the sea would always succeed received a rude shock at Gallipoli", in N. Polmar, and P. Mersky, *Amphibious Warfare: An Illustrated History*, London, 1988, p. 10.

Overview amphibious warfare 1750s to 1914

The naval supremacy that Great Britain enjoyed from the mid eighteenth to early twentieth centuries gave the Royal Navy the means to land British troops on virtually any suitable coast. This ability did not automatically equate to success. During the Seven Years War (1756 to 1767) the British conducted amphibious operations against both France and her colonies, and from 1762 onwards against the far flung Spanish empire. The majority of these early operations were failures, the most famous being the abortive expedition by Admiral Byng to lift the siege of Fort Mahon, Minorca. Byng had defeated a French fleet, but felt he lacked the force required to effect a landing and lift the siege, and retired his fleet. This decision was to result in his court martial and execution by firing squad.

Expeditions by the Royal Navy on the French coast against Rochfort, in 1757, and St Malo, in 1758 also resulted in a lack of success.[55] British amphibious operations in North America were also initially unsuccessful, with the 1757 attempt to seize the French fortress of Louisburg ending in failure. Not until the second expedition was launched in 1758 was Louisburg captured,[56] and entrance to the St Lawrence secured. Success at Louisburg paved the way for the launching of an operation aimed at the capture of Quebec, the seat of French administration in North America.

In 1759 the British sent an expedition to capture Quebec, under the command of Admiral Saunders and General Wolfe. Both were issued orders that emphasised the importance of interservice cooperation, a view that Wolfe endorsed fully after his experiences

[55] D. Marston, *Essential Histories: The Seven Years War*, Oxford, 2001, p.32.
[56] P. J. Haythornthwaite, *The Colonial Wars Source Book*, London, 1997, p. 260.

in earlier amphibious operations during the war.[57] While an initial frontal assault landing failed, a subsequent amphibious flanking manoeuvre succeeded in forcing the French garrison to engage the British force on terrain advantageous to the British.[58] With the capture of Quebec it appeared that the British had finally discovered a successful method for conducting amphibious operations after nearly three years of war.

Ample opportunity to repeat the success of Quebec would come with the entry of Spain into the war as a French ally in 1762. Spanish possessions in both the Philippines and the Caribbean would be overcome by a series of successful amphibious operations conducted by large British forces well versed in the conduct of combined operations.[59] These forces were also equipped with flat bottomed boats which could operate in waters too shallow for regular ships boats.[60] Another innovation was the employment of single deck frigates to provide naval gunfire support.[61] As these vessels were of smaller draft than other warships, they were able to operate closer to shore and provide relatively more accurate gunfire than ships further out to sea.

The key lessons of amphibious warfare, that of careful planning and of the coordination of the naval and military forces involved, had been learnt as a result of operational experience. The dismal record of British amphibious operations during the Revolutionary and Napoleonic Wars (1793-1815) reveals that these lessons were

[57] Keyes, *Amphibious Warfare and Combined Operations*, London, 1943, p. 10.
[58] N. Cawthorne, *History's Greatest Battles: Masterstrokes of War,* London, 2005, pp.80-81.
[59] Marston, p. 72.
[60] R. Harding, "Sailors and Gentlemen of Parade: Some Professional and Technical Problems Concerning the Conduct of Combined Operations in the Eighteenth Century", *The Historical Journal*, Vol. 32, No. 1, p. 37.
[61] Harding, p. 37.

not institutionalised. Neither had the important lesson of using sufficient force to achieve the objective.

A study of amphibious operations conducted by the British during this period reveals that the majority of these campaigns that failed did so as a result of the landing force being too small to achieve the aimed strategic objective. While the actual landings occurred with little disruption, using ship to shore methods perfected in the Seven Years War, the subsequent land campaigns generally resulted in failure. The successful landing in 1799 by a joint Russo-British force in the Netherlands was negated by the force's inability to expel French forces from the territory, due in part to the small size of the force landed.[62] This was repeating an earlier pattern of landing French émigré forces back in France in sizes too small to effect a decisive outcome on even a local level.

The major exceptions to this were the 1801 Expedition to Egypt that conducted a fiercely opposed landing at Aboukir on March 8th, and resulted in the expulsion of the French military presence from Egypt,[63] and the unopposed amphibious lodgement of British forces at Mondego Bay, Portugal, on August 1st 1808,[64] which marked the beginning of British involvement in the Iberian Peninsula and the defeat of Napoleon's forces in Portugal and Spain.

Improvements in the weapon systems that European armies and navies used in their conflicts at the beginning of the nineteenth century had largely been gradual, but the nineteenth century would bear witness to exponential changes brought about primarily by the

[62] C. J. Fedorak, "The Royal Navy and British Amphibious Operations during the Revolutionary and Napoleonic Wars", *Military Affairs*, Vol. 52, No: 3, July, 1988, pp. 143.
[63] P. J. Haythornwaite, *The Napoleonic Source Book* , London, 1990, p. 21.
[64] M. Glover, *Wellington's Peninsular Victories*, London, 1963, p. xii.

industrial revolution. Many writers have called this process of rapid technical change and its resulting impact on how wars were fought as a 'Revolution in Military affairs'[65]. Throughout the greater part of the nineteenth century, technological advances resulted in improvements in all facets of warfare. The resulting advances in infantry weapons, communication, naval ordnance, ship propulsion, construction and design gave military and naval commanders both new tools and new options for conducting campaigns.

The Crimean War (1854-1856) saw the introduction of several new technologies into the fray. While infantry small arms and artillery had changed little from the Seven Years War into the Napoleonic period,[66] the Crimean War saw the usage of the rifle musket, a weapon with eight times the effective range of the smoothbore muskets used in earlier conflicts.[67] Other innovations included the usage of steam powered transports and warships, and the usage of a new type of naval ordnance, the shell firing gun.

The naval superiority of the joint Franco-British navies over that of Russia allowed the Franco-British forces to attempt landings almost at will. Yet despite having command of the sea, failures still occurred. The 1854 Anglo-French expedition against Petropavlosk in the Russian Far East resulted in failure. Despite having a six to one advantage in firepower, the landing force was repulsed in its

[65] W. Murray, "Thinking about Revolutions in Military Affairs", *JFQ*, Summer 1997, pp. 69-76.
[66] R. Gray, (editor), *Weapons: An International Encyclopedia from 5000BC to 2000AD*, London, 1990, p. 308.
[67] For a detailed comparison between the flintlock smoothbore musket and the percussion cap rifle musket see P. J. Haythornwaite, *The Colonial Wars Source Book*, pp. 35-37.

attempts to land.[68] The commander of the British force, perhaps with a view to Admiral Byng's fate, shot himself after this failure.[69]

The main Anglo-French landing in the Crimea was unopposed, but was quite disorganised. Landing operations commenced on September 14th 1854 and took four days to complete. No tents had been landed on the first night, so that when a storm broke the British troops were left without shelter.[70] The tents would not be ordered ashore until the 17th when the artillery was also unloaded. Even then the force faced shortages of provisions and animal transport.[71] Perhaps more surprising is that the Russians passively observed the entire landing operation with no attempt made to disrupt its progress.[72] In contrast the French force landed without incident, and completed its landing with such speed that it was able to offer the British force additional boats.[73]

The landing techniques used during the Seven Years War would remain largely unchanged throughout the Napoleonic Wars and into the Crimean War. Essentially the same system of ship to shore movement occurred with troops landed in ship's boats or other small craft pressed into service. Heavily defended sections of the enemy coast were usually avoided, as whilst the invading army was unloading it was extremely vulnerable to attack. This was due to the piecemeal way in which it would be forced to unload, and the slowness of unloading artillery and horses onto shore. One

[68] J. J. Stephan, "The Crimean War in the Far East", *Modern Asian Studies*, Vol. 3, No. 3, 1969, p. 261.
[69] Stephan, p. 264.
[70] J. Sweetman, "British Invasion of the Crimea, 1854", in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, p. 86.
[71] Sweetman, p. 86.
[72] Sweetman, p. 85.
[73] H. C. Elphinstone, *Seige of Sebastopol 1854-5: Journal of the Operations Conducted by the Corps of Royal Engineers Part 1*, London, 1859, p. 266.

advance in the Crimean War had been the use of steam powered ships to transport the force to the landing area, and the use of steam powered launches to land troops ashore and tow other boats.[74] The usage of steam power meant that an amphibious expedition was no longer dependent on the wind for mobility. The other major difference was that some of the warships covering the landings were equipped with shell firing guns. The naval gunfire support that they could deliver was far greater than had been available previously.

While it had always been possible for an invading force to unload under the protection of the guns of its supporting warships, in practice the gunfire support these ships could provide was limited. Naval ordnance, while often larger than land based weapons, was limited by the lack of stabilisation needed to counteract the pitch and roll of a ship's movement at sea.[75] Naval gunfire support of amphibious operations was further limited by the lack of available optics and the lack of an explosive shell. A supporting fleet would find it difficult to accurately hit targets with any devastating effect. Surprise was thus an important factor in amphibious operations, as prepared resistance could be could be devastating to an unloading force. In an age where warfare was dominated by three mutually supporting arms (cavalry, artillery and infantry) each highly dependent on each other for support, the difficulties of transporting and unloading of horses would also cause problems. As many horses could potentially die during a voyage, an army could suffer great losses in its cavalry arm before unloading had even begun. Furthermore, as horses were the 'prime mover' of artillery pieces,

[74] Elphinstone, p. 10
[75] Fedorak, p. 142.

the mobility of that arm could be greatly reduced by the deaths of horses in transit. [76]

The adoption in 1837 of long range explosive shell firing guns by the French Navy was a major technological innovation soon copied by the other major powers. Shell firing guns had been in widespread use with land forces throughout the Napoleonic Wars, but their successful adoption by the French Navy was as a result of a radical redesign by French General Paixhans.[77]

In order for a shell firing gun to be used aboard ship, it had to conform to the weight and size parameters of existing naval weapons. Shell firing guns on land were generally heavier in order to cope with the stress of firing the shell. Paixhans redesign reinforced the breech of the gun, where most of the stress was believed to occur, but reduced the amount of material along the rest of the barrel. The resulting weapon was thus the same length and weight as existing guns, but much greater in its destructive potential. [78]

The power of this new ordnance was soon realised by most navies and was aptly demonstrated by the French Navy at Vera Cruz in 1837 reducing the coastal fortifications, and inflicting 400 casualties, without the loss of a single ship.[79] The utility of shell firing artillery in amphibious operations was further demonstrated by the success of United States General Scott's 1847 expedition to Vera Cruz. Scott used purpose built shallow draft 'surf boats' to land his force. He then proceeded to encircle the city and reduce it

[76] Fedorak, p. 142.
[77] J. Keagan, *The Price of Admiralty: The Evolution of Naval Warfare*, New York, 1990, p. 110.
[78] DVD media Granada Television *Warship: The history of War at Sea*, 2001.
[79] E. Plunkett, *Past and Future of The British Navy*, London, 1846, p. 90.

by a combination of land and ship based artillery.[80] Scott was thus able to defeat the city without having to conduct a costly assault.[81]

The new weapons were just as effective against other ships. In 1853 a Russian fleet of six ships, equipped with the new guns, engaged a Turkish fleet armed with older non shell firing guns. The resulting engagement at the Turkish port of Sinope resulted in the destruction of the entire Turkish force of seven ships with the Russians suffering no loss.[82] However, it is in the results of the gunnery where the difference shows. The Turks inflicted no less than eighty four hits on the Russian flagship *Imperilritz Marie* resulting in no serious damage.[83] However, when the Russian guns hit a target the effect was devastating. Had the Turks also been equipped with shell firing guns the result may have been less one sided.

The logical counter to the destructive power of the new armament was to be found in armouring ships. When the French Navy used ironclad monitors to bombard the Russian port of Kerch, during the Crimean War, the monitors were able to bombard the Russian coastal batteries with impunity, as the Russian guns were unable to penetrate their armour, even with the use of the new shell firing guns.

The impact of the American Civil War (1861-1865) on this process of military innovation was to take two major forms. The first was

---

[80] J. F. Fleming Polk, "Vera Cruz, 1847", in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, pp. 76-77.

[81] It is not mentioned how costly Scott's bombardments were in terms of the lives of Vera Cruz's inhabitants. Given the indiscriminate nature of bombardments, and the increasing power of naval ordnance, it is little wonder that the bombardment of undefended places would be strictly forbidden in various Hague Conventions.

[82] H. Douglas, *A Treatise on Naval Gunnery*, London, 1860, p. 315.

[83] J. Mordal, *Twenty-Five Centuries of Sea Warfare*, London, 1965, p. 211.

that in the wake of the clash between the ironclads CSS *Merrimack* and the USS *Monitor* the superiority of ironclad over wooden warships had been decisively proven, as had the value of the revolving gun turret. The second was that the experiences of the American Civil War showed the methods of the Napoleonic Wars could no longer be used in conflicts where both sides were equipped with modern weapons and trained in their use. It also demonstrated the great interrelationship between littoral warfare and amphibious warfare.

The problem for the US Navy in attempting to conduct these operations was that at the beginning of the war they were equipped solely with wooden ships, and were attempting to engage forts armed with shell firing guns. In the littoral campaigns the US Navy was forced to engage in while conducting a close blockade of Confederate ports, it became particularly vulnerable to shore batteries, mines, and the occasional ironclad venturing out from port. The development of the US Navy's own ironclads helped with this, but the US Navy was largely confined to conducting the war in the littorals. However, this was the accepted way of blockading a port. Eventually, it would be seen the best way for the Union to blockade a Confederate port was to seize it with joint land and sea operations.[84]

While improvements were being made to the armament and protection of ships, changes were being made to the way ships propelled themselves. While sail powered ships were only limited by the availability of wind and the provision of ships stores, enabling ships to remain at sea for long periods of time, steam

[84] For an excellent summary of the Union's amphibious operations see B. Anderson, "The naval strategy of the Civil War", *Military Affairs*, Vol. 26, No. 1,Spring 1962, pp. 11-21.

powered ships were limited in their endurance by the amount of coal they could carry. Steam powered ships also had the disadvantage that until the development and widespread adoption of the stern mounted screw, they had stern and side mounted paddles that were vulnerable to enemy fire. Steam ships did have the advantage of being able to move without being tied to the prevailing winds, and as the technology improved became faster and larger that similar sail powered ships. Throughout the nineteenth century as warships evolved into the modern form of the pre-dreadnought battleship, ships became larger and heavier. Their destructive potential became greatly multiplied, but their range was greatly reduced and tied to the availability of coal bunkering stations. In addition developments in naval ordnance such as rifled barrels for greater range and accuracy, breech loading weapons, increases in calibre, better fire control systems, better armour, better engines, and better design meant each succeeding generation of warships was better than the last. This process of development would culminate with the launching of HMS *Dreadnought* in 1906, a revolutionary ship that was to be the prototype for the modern battleship, and was superior in weight of fire and range to all ships then in existence.[85]

The creation of modern powerful battleship fleets was in part driven by the theories of Alfred Thayer Mahan. Mahan was an US Navy officer during the civil war and his experiences of the US Navy's close blockades and bombardments of Confederate fortifications made him dubious about the value of any form of sea based power being projected onto the shore.[86] Mahan became convinced by his

[85]R. K. Massie, *Dreadnought: Britain, Germany, And The Coming Of The Great War*, London, 1993, pp. 468-469.
[86]P. A. Crowl, "Alfred Thayer Mahan: The Naval Historian", in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, Princeton, 1996, p. 461.

wartime experience, coupled with his readings of British Naval history, and the writings of Clausewitz, that the correct use of a navy was to destroy the enemy's fleet. This was the basis of his highly influential theory of sea power and its role in history.

In short, the premise was that only by commanding the sea could a nation ensure success in terms of commerce and national prestige. In wartime this could only be achieved by seeking out the enemy fleet and destroying it. To conduct commerce raiding or amphibious operations was to potentially weaken the concentrated striking power of ones fleet. Once the enemy's fleet was found and destroyed these operations were largely unnecessary, as ones opponent, without the protection of their fleet, would soon be brought to the negotiating table before one needed to press home the advantage. The influence of this theory would shape the composition of fleets, their training, and war plans of several powers.

However, successful projection of naval power onto the shore continued throughout this period. For while naval planners were seeking to create better capital ships in order to wage the next Trafalgar, they were also creating better and more advanced systems of naval gunfire support for amphibious operations. This was entirely coincidental, but by creating more powerful warships they were increasing the ability of a fleet to support land operations.

Improvements in the design of ships gave commanders greater scope in both how quickly forces could be sent to an area, but also how much force could be sent. In colonial operations the progressively increasing striking power of the fleets of the great powers allowed them to reduce virtually any fortress, and land large

numbers of well equipped troops under the protective umbrella of their firepower. The loading and unloading of these forces was still similar to those employed in earlier periods. While the transport ships had become larger, troops were still landed using ships boats, lighters, and other small craft. All of these craft left the troops vulnerable as they disembarked, and often resulted in them becoming disorganised even during unopposed landings. The biggest innovation was the usage of steam powered tugs to tow lighters loaded with men and equipment to shore.

Conversely, this also meant that local control of the sea was a priority for any amphibious operation. An enemy fleet could devastate a landing if it was able to get near it. While many observers took the defeat of the Russian fleet at Tsushima by the Japanese during the Russo-Japanese War, 1904-1905, as being proof of Mahan's theory of the decisive sea power, it was actually the earlier attack on Port Arthur that was the real lesson. In order for Japan to land the military forces it needed to seize territory, it had to ensure local command of the sea. The most effective way of doing this was wiping out the Russian fleet at Port Arthur. Once this was done, troops could be landed with no risk of Russian interference. While the Japanese had not completely destroyed local Russian navy forces during the first part of the war, they had managed to claim effective control of the local sea area. This was more in accordance with the theories of British naval strategist Sir Julian Corbett, and his writings on amphibious warfare.[87]

By 1914 the potential value of naval gunfire support was the greatest it had been in any point preceding, and further the utility of

[87]For a more detailed analysis of Corbett's writing on amphibious warfare see, J. D. Gibson, "Sir Julian Corbett on Amphibious Operations", in *Marine Corps Gazette*, Vol. 82, No. 3, pp. 68-72.

this naval gunfire support often greatly exceeded the value of land based artillery in range, accuracy, and rate of fire. Throughout the period examined, amphibious operations remained difficult undertakings due to factors of geography, tenacity of enemy resistance, and poor planning and execution. However as naval armaments improved, so did the likelihood of success, so long as the attacking force was able to maintain at least local command of the sea, and was confining its objectives to those within the range of naval gunfire.

Amphibious Operations in World War One

During World War One, 1914-1918, a number of amphibious operations were conducted. While the 1915 Gallipoli landings are probably the best known, the British had conducted other amphibious operations before then.

The first, the 1914 deployment of New Zealand troops to seize the then German colony of Samoa, was a success. 1914 would also see two other amphibious operations conducted. The first was the Anglo-Japanese expedition against the fortified German colony of Tsingtao, China. The landings were made some distance from Tsingtao and were unopposed.[88] The landing force went on to invest Tsingtao, with Allied naval gunfire support being directed by spotter aircraft.[89] Tsingtao surrendered on November 7th 1914, after a campaign that resulted in 5755 Japanese, 75 British, and 700 German casualties.[90]

[88] The first landing on September 2nd was 100 miles away, while the second landing on the 18th was 30 miles away. T. Wise, " Tsingtao", in *History Of The First World War Vol. 1*, Bristol, 1969, p. 322.
[89] Wise, p. 324.
[90] Wise, p. 329.

1914 also saw a more farcical attempt to seize a German colony by amphibious assault. The operation aimed to seize German East Africa by gaining control of the port of Tanga. The operation was an unmitigated failure, the root cause of which was poor planning. Tanga has been described as embodying "almost every known conceivable error in the theory and practise of Combined Ops"[91]

Briefly put, the Tanga operation had ill trained troops land at night, in an area the enemy knew well, after informing the enemy that they would be arriving. In addition many of the troops were exhausted after suffering from seasickness and cramped conditions for around a month aboard their transports. To make matters worse, before leaving India, many of the troops had been issued new weapons that they were unfamiliar with, and could not use effectively.[92]

Major General Aitkin, the commander of the expeditionary force had decided to continue with the operation after learning that that any chance of surprise had been lost due the Royal Navy insisting that it inform the German governor that a local truce was to be ended, before any operation could proceed.[93]

German defences around Tanga were thus ready and prepared for Aitkin's landing at 2200 on the night of November 2nd. Aitkin's initial advance on Tanga township was repulsed, and the terrain, German counter attacks, and the unsteadiness of much of Aitkin's force hindered further attempts. On November 5th, Aitkin evacuated his force, leaving behind large amounts of rifles,

[91] B. Ferguson, *The Watery Maze: The Story of Combined Operations*, London, 1961, p. 24.
[92] R. J. Sibley, "East Africa Fiasco at Tanga" in *History Of The First World War Vol. 1*, Bristol, 1969, p. 359-360.
[93] Sibley, p. 360.

ammunition, machine guns, and other stores. The British had suffered over 800 casualties, while the much smaller German force had only suffered the loss of 60 men.[94]

While the strategic aims of the operation, the reduction of German forces in East Africa, had been sound, the planning and execution of the operation was poor resulting in failure – a fate earlier British amphibious operations had suffered for the same reasons. The strategic aims behind the Gallipoli campaign were also sound. If the Dardanelles could be forced, then Constantinople and the bulk of Turkish war industry could be directly threatened, resulting in Turkey dropping out of the war. In addition the resulting access to Russia's Black Sea ports would allow France and Britain access to badly needed grain, and the Russians to badly needed weapons to equip their armies.

The means and methods necessary for forcing the Dardanelles was a problem that had vexed British military planners for some time before World War One. Between 1900 and 1914, no less than four separate staff studies had looked into the problem.[95] The general consensus of these plans was that to attempt to force the straits with ships alone "was unlikely to attain any useful purpose"[96] and that the operation would require the deployment of several thousand troops in addition to a large number of warships. Indeed the 1908 study by the War Office recommended the deployment and for the landings and bombardment of coastal fortification to occur simultaneously.[97]

[94] Sibley, p. 360.
[95] See C. F. Aspinall-Oglander, *History of The Great War: Military Operations Gallipoli Vol. 1: Inception of the Campaign to May 1915*, London, 1992, pp. 25-30 for an overview of these plans.
[96] Aspinall-Oglander, p. 29.
[97] Aspinall-Oglander, p. 29.

Apart from stressing the large amount of military resources, all of these plans stressed the need for, and the difficulty of, achieving surprise for the operation. In essence, for the operation to succeed significant numbers of troops would need to be committed to action simultaneously and the Turks had to have no prior warnings of the operation. Any advance warning of the operation would give the Turks ample time to bolster their defences, which could result in the operation's failure. Despite the recent experience of Tanga, and the conclusions of the prewar staff studies, the Dardanelles campaign was conducted in a piecemeal fashion with each step giving ample warning of the next.

For the straits to be opened, both the series of Turkish minefields and the coastal batteries had to be eliminated before the Turks could reinforce their shore defences. On February 19th 1915, Admiral Carden, commanding a force of 12 capital ships, engaged the coastal forts with long range bombardment. Despite a lack of return fire it was obvious that to eliminate the forces a close bombardment was necessary. Bad weather prevented this until February 25th, when Carden's deputy, Admiral de Robeck, with a combination of naval gunfire and landing parties, destroyed the gun positions at Kuru Kale and Sadd-el-Bahr. Despite this success, Turkish reinforcements, backed by mobile batteries of 6-inch howitzers, forced the landing parties to withdraw. The element of surprise, vital to the pre-war plans, had been lost.

While the battleships of Carden's fleet were well protected against these howitzers, the accompanying force of mine sweepers was not. This resulted in them being unable to clear the channel of mines due to the refusal of their civilian crews to face artillery fire

while clearing mines. Because of continued bad weather, the seaplanes used as spotters for naval gunfire were unable to fly,[98] so the fleet was unable to eliminate the mobile batteries without moving closer. To do so, they risked being sunk by mines and waiting for better weather only allowed the Turks to increase their defences.

In order to solve this impasse, Carden's chief of staff, Commodore Keyes, scoured the fleet for volunteers to man the minesweepers. On March 13th, six minesweepers and a cruiser HMS Amethyst attempted to clear the minefields. Four minesweepers were sunk. Further attempts were made on the following two successive nights. These attempts were also repulsed. Under the constant pressure from London to force the straits, and faced with these repulses, Admiral Carden relieved himself of command under medical advice.

Faced with messages urging haste from London, and the failure of light forces to remove the minefields, de Robeck made an attempt on March 18th to force the narrows with his battleships. While initially successful, this attack soon faltered with three battleships sunk by mines.

Keyes was convinced that another attack would succeed. He based his assessment on his estimates of Turkish ammunition stocks that he believed to be virtually expended,[99] and his appraisal of the strength of the Allied fleet. The arrival of reinforcements, consisting of six battleships (four British and two French), combined

[98] M. Hickey, *Gallipoli*, London, 1995, p. 52.

[99] Some debate exists as to the correctness of Keyes' assessment. For an opposing view see E.J. Erickson., "Ottoman Military Effectiveness at Gallipoli, 1915", *The Journal of Military History*, 65, October, 2001, pp. 998-1012.

with his re-crewing of the surviving minesweeper trawlers with naval crews, in addition to equipping destroyers with minesweeping gear, meant the fleet still remained capable in Keyes' opinion of clearing the straits. Keyes' arguments initially swayed de Robeck but by March 22nd de Robeck had decided the army had to be used. Despite consternation at the Admiralty, de Robeck's opinion as admiral on the spot was supported. The decision was then made to force the straits by landing a sizable body of troops on the Gallipoli peninsula and at Kum Kale on the Asiatic coast. The resulting delay between the last naval attack on the 19th of March and the eventual landings on the 25th of April had given German General Liman von Sanders ample time to reorganise Turkish defences and conduct intensive training of his forces.

The subsequent failure of the campaign stems from this point. Had even half the 74,800 troops used on the April 25th landings been ready and available to support the naval operations in March, it is virtually certain the straits would have been forced. The failure to have these troops available stems from two main sources, first the demands of a global war, and second extremely poor planning.

The landings failed, despite immense heroism on the part of the Allied troops, to achieve their stated objectives. Partially, this was due to limited numbers of craft being available to land the troops, because of which only 30,000 troops were able to be landed on the first day. The beaching of SS *River Clyde* had not gone as planned, the original plan being to get a large number of men to the beach safely by beaching a large ship, as opposed to transporting them ashore in small boats, in a manner similar to the LSTs[100] of

[100] Landing Ship Tank.

World War Two. Instead, it resulted in a 'turkey shoot' for Turkish machine gunners.

Also the lack of effective communications resulted in confusion, and many local successes were not reinforced, but largely the fault lies with General Hamilton. By remaining on the battleship, *HMS Queen Elizabeth*, Hamilton remained unable to coordinate the operation, resulting in the fleet being unable to deliver supporting fire due to a lack of communication with the shore, and land forces being unaware of the overall situation. While Hamilton's presence would not have solved all these problems, it would have reduced their effect.[101] It is also possible that if Hamilton had been ashore he might have realised that the Turkish forces had also suffered heavily, and with some 34,800 men still left to come ashore, Hamilton might have been able to exploit this. Instead Hamilton gave the order to dig in, in order to regroup his forces and consolidate his position. This respite also gave the Turks the chance to bring up reinforcements.

Despite the sacrifice of many brave men on both sides over the coming months, a stalemate developed with Hamilton's forces bottle up in two separate areas, Anzac, and Cape Helles. A subsequent landing on August 6th was designed to land sufficient forces at Suvla so that the Turkish forces blocking the advance up the peninsula would be outflanked and obliged to withdraw, thus clearing the way for a general advance towards the narrows. The key to this plan was that forces landed at Suvla would rapidly expand out of their beachhead and seize both the Chocolate and Green Hills. Possession of these would allow them to attack the Tekke Tepe ridge. This would be supported by a breakout from

[101] A. Moorehead, *Gallipoli*, Ware, 1997, pp. 107-108.

Anzac designed to both cover operations at Suvla, and seize the Sari Bair Ridge. Holding these features was the key to out flanking the Turks on the Gallipoli Peninsula. The plan resulted in failure, when General Stopford, in command of the landing force failed to seize the hills in front of his landing beach.

After the failure at Suvla, the Allies could either reinforce or withdraw their forces. With other theatres competing for resources, and the likelihood of success becoming ever more fleeting, the decision was made to evacuate the Allied positions. Suvla and Anzac were the first to evacuate on the night of 19th/20th December 1915. The operation went without hitch with only two men wounded at Anzac. The withdrawal at Anzac and Suvla freed up Turkish forces for use against the Helles position, which had had its strength reduced from 40,000 at the end of 1915 to only 15,000 by January 7th, 1916, when the last Turkish offensive was launched. The attack, while featuring the heaviest Turkish bombardment of the campaign, failed to break the British line. Many Turkish infantry also refused to advance during this attack, probably sensing that after the withdrawal of troops from Anzac and Suvla, Helles was soon to follow.[102] On the night of January 8th/9th this was proved correct with the successful evacuation of Helles. The success of the evacuations was due to careful planning and preparation, with devices such as automatic firing rifles used to maintain the illusion of occupancy until the troops had departed. In view of the history of the campaign as a whole, this is somewhat ironic.

Despite the failure of the Dardanelles campaign, the British still viewed amphibious operations as being credible. A number of

[102] T. Wilson, *The Myriad Faces of War*, Cambridge, 1986, p. 275.

assets suitable for amphibious operations had been kept in home waters during the Gallipoli campaign including a number of armoured landing craft. A variety of feasibility studies and experiments with landing equipment were conducted by the Royal Navy during the war, even after the failure of Gallipoli. These experiments included attempting to solve the problem of getting tanks ashore. The purpose behind keeping these assets in home waters was to maintain the ability to allow the launching of a cross-Channel invasion should the military situation prove it necessary.[103]

The Royal Navy also conducted a series of cross-Channel raids in 1918, with the objective of causing disruption to the German U-Boat campaign. These raids, while only limited successes, were planned with the utmost care, and often had ships purpose built for them. The British war record of amphibious warfare was not a happy one, but neither was it entirely without success. In particular the Royal Navy would prove highly successful in conducting evacuations.

The Germans conducted very few amphibious operations during World War One. The largest operation they conducted was Operation Albion, which was to seize the strategic Baltic Islands of Oesel, Dagoe, and Moon at the entrance to the Gulf of Riga. By seizing these islands, the Germans could secure the Gulf of Riga, and directly threaten Petrograd. The German Navy had proposed the seizure of these islands as early as 1890, as part of plans for use in the event of a Russo-German war.[104] The idea had been proposed throughout the war, but the German Army doubted the navy's ability to maintain sea communications with the islands if

[103] For an excellent discussion of this, see Paige's article "The Great Landing 1917" in the *International Journal of Naval History*, Vol. 1, No. 1, April, 2002.
[104] A. H. Ganz, "'Albion' – The Baltic Islands Operation", *Military Affairs*, Vol. 42, No. 2. 1977, p. 92.

they were taken.[105] In 1917, Russia was on the verge of collapse, and Germany desperately needed to knock Russia out of the war before the impact of American involvement was felt on the Western Front. While German troops were within two days normal march of Petrograd, they were unable to directly threaten the city due to their advance being blocked by forest and marsh. The operation would thus act as a *coup de grâce*, knocking Russia out of the war.

The historiography of this operation is of particular interest. The chief of staff of the expedition, Lieutenant General von Tschischwitz, wrote a history intended to preserve the knowledge gained about amphibious operations during the operation for future generations of German officers. This book, *The Army and Navy during the Conquest of the Baltic Islands in October 1917*,[106] goes into great detail about the planning, preparation, and execution of the operation.

As Germany had no tradition of amphibious warfare the planners had to reinvent the wheel based on their observations of the Gallipoli campaign, and examining the problems on a practical basis. Naturally a work of such nature would be of interest to any organisation developing its own amphibious doctrine. Interestingly enough, this work was translated into English by the US military during the period it was formulating its own amphibious doctrine. Both the US Army and the US Marine Corps held copies of the work during the period they were developing their own amphibious doctrine.

[105] Ganz, p. 92.
[106] Tschischwitz, *The Army and Navy during the Conquest of the Baltic Islands in October, 1917*, Washington, 1933.

Planning for the operation involved the gathering of information on the islands' defences. This was achieved by using both spies and aerial reconnaissance.[107] The chain of command for the expedition was also clarified in a Field Order from Eighth Army Headquarters. This field order formed the basis for the operational plan for the expeditionary force, and outlined the objectives of the expedition and the responsibilities of each service. A great deal of effort was spent before the operation in ensuring the integration of Army and Navy communication systems, even going to the extent of exchanging radio officers to act as liaisons.

The operation was wargamed, and proved to be a success.[108] Detailed planning was undertaken for the operation, with no detail proving too small for consideration. Meteorological surveys were undertaken to ensure good weather with the embarkation being delayed because of this. The delay in embarkation was spent in training, familiarising the troops with the small craft they would use to land on the island. In addition to commandeered barges and prams, the Germans also used horse scows for the landing of horses and vehicles. “These are pontoon-shaped boats, rather long and flat bottomed, the broad rear gate of which would fold down and serve as a landing gate”.[109]

[107] Tschischwitz, p. 17.
[108] Ganz, p. 93.
[109] Tschischwitz, p. 26.

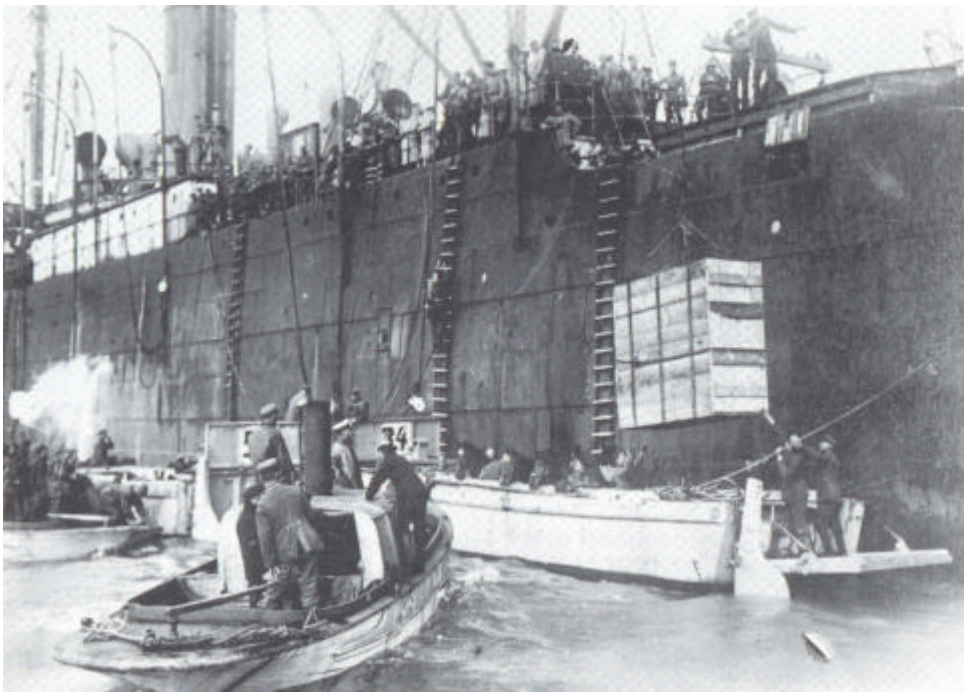


Photo 1. German Horse Scow being loaded. (IWM Collection)[110]

The invasion force would consist of the 42nd Infantry Division, consisting of three infantry regiments and its supporting troops and artillery. In addition, the force would have an additional regiment of Bavarian infantry, five bicycle battalions, two squadrons of cavalry, and three heavy artillery batteries. This resulted in a grand total of 24,596 men.

The naval component would consist of 19 transports, and 11 dreadnoughts. As Germany only had 24 dreadnoughts available at this stage of the war, the number of capital ships allocated to this operation seems rather high. However, as part of increasing level of war weariness experienced in Germany as a whole, unrest

[110] Photo from B. Friend, and R. Gardiner, "Amphibious Warfare vessels" in *Conway's History Of The Ship: The Eclipse of the Big Gun: The Warship 1906-45*, London, 1992, p. 142.

amongst the fleet was on the increase. As such the admirals were always keen for any opportunity to exercise the fleet.[111]

The troops were embarked on October 9th, with the fleet sailing on the 11th, under a protective umbrella of aircraft patrolling for submarines. The landing took place on the 12th, under the cover of the fleet's guns. While the Russians put up spirited resistance, the Germans had allocated enough force to ensure success. The landings had been a complete success, and the footholds gained allowed the successful continuation of the operation, with the conquest of Oesel being completed by the 16th. The Germans then turned their attention to Moon Island, landing troops on the 17th, the Russians surrendering a little after midnight on the 18th. A landing had been made on Dagoe Island on the 15th, but Russian resistance was not eliminated until the 20th of October.

Tschischwitz, in his book, goes to great lengths to stress the importance of cooperation between the navy and army as being vital for the success of the operation. While accepting that by 1917 Russia was virtually defeated, he points out that the success of this operation was not a foregone conclusion, and that but for the careful planning, preparation, interservice co-operation the expedition could have resulted in failure. Tschischwitz also stresses that these are the keys to a success amphibious operation, and that they should not be forgotten, as in the future the German people may have need of them.[112] All three of these factors were absent in the British operations at Gallipoli. Operation 'Albion' stands as an example that opposed landings could be conducted successfully

[111] Ganz, p. 93.
[112] Tschischwitz, p. 244.

with the technical means available to military and naval commanders during World War One.

Planning the Future

The process of planning for the next war begins with the end of the last. The end of War World One was no exception. The planning of expeditions to contain the 'Red Menace' of communism, put down various colonial insurrections, and cope with the instability caused by the dissolution of three major empires occupied the staffs of the victorious Allied powers. The process of trying to assimilate the lessons taught by the war was also occupying the thoughts of many theorists and military staffs. The war had also introduced many new weapons, and various theorists sort to champion them, or portray them as being an exception brought about by unusual circumstances. Efforts were made to draw parallels with earlier conflicts to see if that could aid any explanation as to what had occurred, for it was clear that the war had not 'ended by Christmas' as had been widely believed in 1914.

The sheer scale of the war had also had its impact on this process. The financial and human cost of the war was immense. The huge cost in human life helped fuel a pacifist movement in many countries. This had the effect in the western democracies of encouraging disarmament, leading in part to treaties such as the 1922 Washington Naval Limitation Treaty, and a desire to reduce military budgets. Partially, this desire to reduce military spending sprang from the financial burden of the war, and the large war debts even the victorious Allies were facing.

The events of the war were analysed by military theorists hoping to explain what had occurred, and to determine what, if any, lessons

could be learnt from both the successes and failures. In the study of amphibious warfare, “The Dardanelles were fought all over again, in printers ink and at the Staff Colleges, in Britain, the United States, and Australia.”[113] Partially, this was done in an attempt to explain what had occurred, either to condemn, as Liddell Hart would, opposed landings as being impossible, or to see if past mistakes could be avoided. For each of the powers focused on in this study, World War One had resulted in victory, but each would emerge with conclusions shaped by both their own experiences, and their interpretations of the war as a whole. Over the next twenty years this would result in a number of interesting developments.

[113] Ferguson, p. 35.

Chapter Three Interwar Developments and Operations

For the purposes of this study, the 'interwar' period is defined as being the period between the end of World War One and the beginning of the Pacific War on December 7th, 1941.

During this period the development of amphibious warfare was of great interest to the militaries of Japan, the United States, and the United Kingdom. However, this interest was to manifest itself in very different ways. This was a result of the dissimilar wartime experiences of each nation, the political and economic conditions of each nation, and the quite diverse concerns of each nation.

The immediate postwar period saw the militaries of both the major and minor powers attempt to integrate the lessons and new technologies of World War One into the way they would fight future wars. The impact of World War One was immense, both in the sheer scale of the conflict, and in the way new technologies were used to fight it. Each of the three powers in this study conducted extensive staff studies on the Gallipoli campaign in an attempt to determine what happened and if opposed amphibious operations were possible.

World War One had in effect caused a revolution in military affairs as a result of the application of new technologies such as aviation, light automatic weapons, armoured vehicles, and chemical weapons. Combined with new doctrines and organisational concepts these radically changed the fundamental character and conduct of military operations. World War One had seen the introduction, and widespread adoption, of these new technologies

and theorists spent much of the interwar period debating over their employment in future conflicts.

The immediate postwar period was characterised by instability in the territories of the former Central Powers and the former Russian Empire.[114] The landing of forces where these interventions took place followed the nineteenth century pattern of operations, with the landing of forces away from defences, and the establishment of a defensive perimeter that allowed the landing of more forces.

Allied intervention in Russia was a result of the desire of Britain, Japan, and the United States to reclaim war material that had been sent to Russia during the war. These expeditions soon became involved in Russia's civil war, eventually resulting in the Allies' evacuation of 'White' non-communist forces following the success of the Bolsheviks in the civil war. These evacuations followed the traditional pattern of amphibious operations. The Allied naval forces arrived at a port, picked up the evacuees, and then left. The 1920 March evacuation of the Port of Novorossiisk took place amid scenes of chaos. Despite the wholesale desertion of White forces abandoning the city's defences to join mobs of refuges, the evacuation was protected by a curtain of Allied naval gunfire, preventing the advance of Red forces. Despite this the evacuation was a mixed success as there were too few transports to evacuate all who wished to flee.[115] The final evacuation of White Russian forces from the Crimea on November 14th 1920 marked the end of the Russian Civil War. This evacuation was carried out in an orderly fashion with White Russian troops conducting an orderly fighting

[114] For a narrative of the various revolutions, uprisings, and coups in the immediate aftermath of World War One, see M. Gilbert, *A History Of The Twentieth Century Volume One: 1900-1933*, London, 1997.
[115] For a description of the Novorissiisk evacuations see R. Pipes, *Russia Under The Bolshevik Regime 1919-1924*, London, 1997, pp. 130-131.

retreat allowing the embarkation of over 144,000 troops and civilians onto a fleet of 126 ships of various types.[116]

The human and material cost of World War One resulted in a number of attempts to prevent further conflicts by the use of the concepts of collective security, open diplomacy, and disarmament.[117] The formation of the League of Nations was meant to result in the institutionalisation of these concepts and provide a mechanism for their enforcement. As the United States did not join the League, and Japan left in 1933, it failed to achieve these goals.

Disarmament was an issue that did meet with some limited success. The 1921 Washington Naval Limitation Conference resulted in the signing of a treaty in 1922 that limited the size of each signatory's fleet. The treaty, while placing strict limitations on the size and number of battleships, contained no limitations on amphibious warfare vessels, and only slight limitations on aircraft carriers.[118] Both of these would be of great importance in the coming conflict in the Pacific.

British Developments 1919-1941

The end of World War One saw Britain theoretically in possession of a significant capability to conduct amphibious operations. With the vast size of the Royal Navy, Britain had the naval assets required to transport, protect, and support an amphibious operation, but it lacked an efficient means of transporting men and material from ship to shore.

[116] P. N. Wrangel, *Always with Honour,* New York, 1957, p. 326.
[117] G. A. H. Gordon, *British Seapower and Procurement between the Wars: A Reappraisal of Rearmament*, London, 1988, p. 72.
[118] K. J. Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, Laurens, 1983, p. 25.

In addition the Dover Patrol,[119] during the tenure of Commodore Bacon, had conducted experiments with the aim of finding a rapid method for disembarking troops and even tanks on the Belgian coast,[120] and had conducted two major amphibious raids on German installations at Zeebrugge and Ostend in 1918. The operations of the Dover Patrol, and the failures of Tanga and Gallipoli had left Britain with a large and varied body of recent operational experience.

However, despite this excellent foundation, and its long and proud tradition of conducting naval operations, Britain would enter World War Two with only the most rudimentary amphibious capability. This erosion of Britain's amphibious capability was the result of three main factors: flawed analysis of wartime experiences, reduced defence expenditure, and the absence of a defined need for the capability.

The spectre of Gallipoli was to loom large over the postwar analysis of amphibious operations. Both the Army and the Navy desired to know what could be learnt from the mistakes made at Gallipoli. Whilst the Gallipoli campaign had resulted in failure, its failure had not discredited the entire concept of amphibious operations. Indeed, the fact that the British continued to develop plans in 1917-1918 for a landing on the coast of German occupied Belgium, shows that amphibious operations were still viewed with merit in some quarters.

[119] The Dover Patrol was tasked with maintaining command of the English Channel, but also with conducting littoral warfare and raids against German naval bases on the Belgian coast.
[120] See R. Bacon, *The Dover Patrol 1915-1917 Vol. II*, New York, 1919, pp. 282.

However, Gallipoli, the largest amphibious operation of the entire war, had resulted in failure and in 1919 the British Admiralty established the Mitchell Committee to analyse the campaign in detail and produce a report explaining why.[121] The same year, an interservice exercise was held at Camberley Army Staff College. This exercise was based on the Gallipoli campaign and the participation of both Army and Navy veterans of the campaign. The result of this exercise was for the college commandant, W.H. Anderson, to call for the establishment of an interservice committee to see how the experiences of the last war could be integrated into British amphibious doctrine.[122] The resulting Anderson Committee had representatives from the Royal Navy, the Army, and the fledgling Royal Air Force. Its first effort was the production of a chapter on combined operations for the 1921 Army Field Regulations and a recommendation that the joint amphibious doctrine receive further analysis.[123]

Unfortunately, it was this concept that amphibious operations were primarily a combined operation that was to result in problems. At the same time that the lessons of Gallipoli were being examined, the Admiralty was looking at another kind of combined operation, that of the defence of naval bases. The Admiralty was concerned about the impact of airpower on the defence of its naval bases, an issue complicated by the absorption of naval aviation into the Royal Air Force.

[121] A. Marder, "The Influence of History on Sea Power: The Royal Navy and the Lessons of 1914-1918", in *The Pacific Historical Review*, Vol. 41, No. 4., Nov., 1972, p. 415.
[122] D. MacGregor, "The Use, Misuse, and Non-Use of History: The Royal Navy and the Operation Lessons of the First World War", *The Journal of Military History*, Vol. 56, No. 4, Oct., 1992, p. 606.
[123] MacGregor, p. 606.

A series of interservice exercises on the defence of Singapore and Hong Kong were held at the Army Staff College.[124] While the exercises resulted in reports recommending a thorough review of the 1913 *Manual of Combined Naval and Military Operations*, the resulting interservice committee resulted in a "staunch defence of the status quo, service independence, and rejection of the importance of preparing for opposed landings".[125] This result was hardly surprising given the financial pressures on military budgets. World War One had been enormously expensive for Britain, in both financial and material terms. Britain had gone from being a creditor nation with a strong economy, to being a debtor nation with large war debts, extensive Imperial defence commitments, and a need to reduce defence expenditure. This was to be achieved by reducing forces, selling surplus equipment, reducing exercises, and minimising research and development.

The development of amphibious doctrine was thus to be hampered by interservice politics in a time of decreasing military budgets. While amphibious operations were not completely ignored at the school level with exercises and lectures being regularly conducted at both at the Naval War College[126] and the Army Staff College, only two major exercises were conducted during the 1920s using troops.[127] And these, the 1924 landing of troops in the Bay of Bengal by Rear Admiral Sir Herbert Richmond, and the 1928 landing of troops in the Moray Firth in Scotland, were the result of the initiative of local commanders.[128]

---

[124] A. R., Millett, "Assault from the Sea: The Development of Amphibious Warfare between the Wars: The American, British, and Japanese experiences", in *Military Innovation in the Interwar Period,* New York, 2005, p. 60.
[125] Millett, p.60.
[126] MacGregor, p. 606.
[127] Millett, p. 60.
[128] Millett, pp. 60-61.

So while the 1920s would see the revision of the combined operations manual in 1925 and numerous school studies of amphibious operations, the assumptions these theoretical classroom exercises made would remain unchallenged by practical experience in field exercises. At the same time, a growing opinion was emerging in the British military that opposed landings were now impossible in the face of modern artillery, machine guns, and air power.[129] Many of these misgivings over the absolute power of the defensive could have been resolved if exercises had been conducted. Furthermore, what doctrine did emerge was based on unchallenged assumptions, creating a distorted view of amphibious operations. The prevailing assumptions were that for an amphibious operation to succeed, it had to be conducted with the element of surprise, preferably under the cover of darkness, and that an assault on a well defended beach was doomed to failure.[130] These assumptions were codified in the subsequent review of the combined operations manuals in 1931.

This prevailingly pessimistic view of amphibious operations was compounded by the British view that amphibious operations had to be conducted with the cooperation of all three services, and that naturally any doctrine for conducting amphibious warfare had to involve all three services in its production. Unfortunately, the focus of the Army was on colonial campaigns, and later in the mid thirties, continental operations, which the Army believed would only involve transport operations and not amphibious operations. The Royal Air Force believed that airpower had rendered amphibious operations obsolete, and as such tendered little support for the development of

[129] MacGregor, p. 607.
[130] MacGregor, p. 608.

amphibious doctrine.[131] This left only the Navy with an ongoing interest in amphibious warfare, but without the cooperation of the other services, it was unable to solve the problem alone.

The one organisation that could have claimed amphibious operations as a niche role was the Royal Marines but in 1922 they were faced with a drastic reorganisation due to financial pressures. This reorganisation resulted in the merger of the Royal Marine Artillery Regiment with the Royal Marine Light Infantry Regiment, and the closing of some base depots.[132] This merger cost the Royal Marines their organic artillery capability, resulting in a dependence on the Army for providing artillery support in any future exercises or operations. The loss of this artillery component reduced the Royal Marines' ability to conduct amphibious operations alone in the spearhead role that the US Marines were training for during this same period.

In 1923, the Admiralty established the Madden Committee to determine the role of the Royal Marines during wartime. The committee was headed by Admiral Sir Charles Madden, and consisted of four naval officers, and two marine officers.[133] In 1922 the committee concluded that the wartime functions of the Royal Marines were:

1. To provide detachments for larger surface units of the Royal Navy, capable of acting as gun crew and as shore parties.
2. To provide forces capable of the seizure and defence of temporary bases, and conducting raids on enemy coastlines.

[131] Clifford, p. 69.
[132] Millett, p. 61.
[133] D. F. Bittner, "Britannia's Sheathed Sword: The Royal Marines and Amphibious Warfare in the Interwar Years – A Passive Response", *The Journal of Military History*, Vol. 55, No. 3, Jul., 1991, p. 349.

3. To act as a liaison between the Army and the Navy.[134]

However, despite establishing the role of the Royal Marines as a wartime amphibious striking force, the Madden Committee still placed the provision of shipboard detachments as the Royal Marines' primary role. Also, the report omits two other roles for the Royal Marines; the first being the guarding of naval bases during peacetime, and the second providing units for service with the Army in the field.[135] By placing shipboard detachments at the top of priorities for the Royal Marines, budgetary priority was given to fulfilling this goal. Indeed the limited increase in the size of the Royal Marines went towards manning ships detachments.[136] The omission of providing guard detachments for naval bases, and units for service with the Army in the field was designed to avoid encroaching on functions that were traditionally the domain of the Army.[137] While the assumption of these duties could have resulted in a larger marine force, better equipped for amphibious operations, they would have resulted in a lack of goodwill from the War Office.

So while the reforms envisioned by the Madden Committee recognised the potential value of the Royal Marines as an amphibious force, they ultimately served to preclude the development of such a force by giving its development a lower priority in a time of budgetary constraints. These budgetary constraints that resulted from the vast debts incurred during the war were further strained by the onset of the Great Depression in the early 1930s. The need for cutting military budgets, whilst still making a credible imperial defence, resulted in few funds being

[134] Bittner, p. 349.
[135] Bittner, p. 350.
[136] Bittner, p. 350.
[137] Bittner, p. 350.

available to cover all commitments, let alone fund the required expansion of the Royal Marines. The Madden reforms were to remain, throughout the 1920s and 1930s, a promise unfulfilled.

In 1934, Admiral Lord Cork and Orrery, Commander in Chief of the Home Fleet, conducted the last major British amphibious operation of the interwar period. Forty two ships of the Home Fleet were used to land an Army Brigade group against an opposing brigade group at the mouth of the Humber River.[138] At the conclusion of the exercise, designed to test communication techniques,[139] Lord Cork and Orrery stated "a great deal more investigation and experiment will be necessary before it can be affirmed that it is possible in these days to land a division on open beach against opposition".[140]

At this time, the Japanese had been routinely conducting division sized amphibious exercises since 1920. In addition, while the Japanese had been developing and experimenting with the specialised ships and small craft required for amphibious operations, the British continued to utilise the surface units of the Royal Navy for transporting personnel and equipment during exercises, and landing them in the ship's boats of the warships involved. However, in administrative exercises of ship to shore logistics, a flat bottomed, bow ramped, landing craft was used, despite the British not having a craft like that either in service or development.[141] The Japanese had a craft with those characteristics, the type 'A' Daihatsu, in service since 1930.

[138] Clifford, p. 48.
[139] Millett, p. 61.
[140] Cited in MacGregor, p. 607.
[141] Bittner, p. 355.

The Admiralty was not unaware of the development, being made in amphibious warfare by Japan and the United States, but it was not until 1936, after a report by Royal Navy Captain Bertram Watson, that the Admiralty was able to persuade the War Office and the Air Ministry that further study of amphibious operations were required.[142] Finally, in 1938, after nearly two years of interservice bureaucratic wrangling, the Chiefs of Staff established the Inter-Service Training and Development Sub-Committee, which in turn established the Inter-Service Training and Development Centre (ISTDC), at Eastney Barracks, Portsmouth.[143] The mandate of the ISTDC was to cover the development of all interservice operations. While the Navy was interested in the development of amphibious doctrine and equipment, the Army and the Royal Air Force were more interested in the development of airborne forces.[144]

Two events occurred during this two year interval which served to influence the development of British amphibious thought. The first was the 1936 Republican invasion of the Nationalist held Balearic Islands, during the Spanish Civil War. Despite having artillery, air, and naval support, the invading Republican forces were forced to withdraw from their beachhead due to the intervention of modern Italian airpower, bombing and strafing Republican forces with little opposition.[145] This served to strengthen the Royal Air Force view that amphibious operations were particularly vulnerable in the face of modern airpower.[146]

---

[142] Clifford, p. 60-65.
[143] Millett, p. 63.
[144] MacGregor, p. 612.
[145] A. Beevor, *The Spanish Civil War*, London, 1999, pp. 106-107.
[146] The 1938 edition of the Royal Air Force War Manual's chapter on combined operations, *Air Publication 1300 Royal Air Force War Manual Part I. – Operations*, n.p., 1938, chp. XIII, para. 28, states that in amphibious operations "the advantage usually lies with the air force opposing the landing".

The second event was the outbreak of the Second Sino-Japanese War in 1937. The scale of the Japanese landings at Shanghai, and at other locations on the Chinese coast, served to reinforce the Admiralty's view that Britain had allowed its amphibious capacity to decline to an unacceptable level.

The opening of the ISTDC occurred only two months before the Munich Crisis in 1938, which served to focus all three services towards the immediate possibility of another European war against Germany. As this war was unlikely to offer the need for the employment of amphibious operations, development of such capability was accorded a lower priority.[147] The 1938 Combined Operations manual reflected the belief that Britain would not require an amphibious capability in the next war. While the ISTDC did conduct some experimentation and theoretical exercises before the outbreak of war with Germany in 1939, these experiments and exercises were both small in scale and based on the faulty assumptions of the 1920s and early 1930s.[148]

By the time the British economy was starting to recover from the Depression, the prospect of a new European war resulted in rearmament priorities being focused towards the projected needs of that war. The belief by airpower theorists that an invading amphibious force could be defeated by airpower alone was also to greatly retard the development of British amphibious theory.[149]

Because it was believed that in any future European war, as in the last war, British troops would be able to use French ports, amphibious warfare became a much lower priority for military

[147] Clifford, p. 64.
[148] Millett, p. 63.
[149] Clifford, p. 69.

spending.[150] The expulsion of Allied forces from the continent following the fall of France in 1940 was to put the need for amphibious forces sharply back into focus.

Japanese Developments 1919-1941

World War One had been a successful war for Japan, resulting in territorial gains in the Pacific and China in exchange for little materiel or human cost. Japan had conducted several amphibious operations during the war, but these had all been unopposed landings. The Navy had seized the German-held Caroline, Marshall, and Marianas Island groups, while the Army had landed troops on the Chinese mainland before beginning the siege of the German fortress at Tsingtao.

These operations had all followed the traditional nineteenth century pattern of having light forces land on an undefended shore, creating a lodgement that would allow for the disembarkment of the rest of the force. However, operations against undefended shores could not always be guaranteed, and the Allied failure at Gallipoli had aptly demonstrated the difficulties of conducting operations against a well defended shore. As a result, the Japanese military started to develop the techniques and equipment required for conducting opposed landings.[151]

While both the Japanese Navy and Army had an abysmal record of interservice co-operation, amphibious operations were the one area in which both cooperated effectively with each other.[152] This co-operation was born out of strategic necessity due to the nature of

[150] B. Ferguson, *A Watery Maze*, pp. 35-36.
[151] D. C. Evans, and M.R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941*, Annapolis, 1997, p. 442.
[152] Evans and Peattie, p. 441.

Japan's geography. As Japan is an archipelago, in order to project military force on to mainland Asia, or into the Pacific, an amphibious capability was required.

While both services developed amphibious forces, the respective forces evolved along very different paths. The Navy had traditionally projected power ashore in the form of lightly armed landing parties. Rikusentai (Naval landing party) units were also used as garrison units at naval installations. Rikusentai were composed of sailors who were given minimal infantry and small arms training and could be deployed as and where the need arose, as up to a third of a ship's company was available for such operations.[153] This naval rapid reaction force was normally deployed to quell disturbances, or to protect Japanese lives and property.[154] Any operation that required the landing of a division or larger sized force would necessitate the involvement of the Army.[155]

As a result of its study of Gallipoli, the Japanese Army had reached two conclusions, the first that they should not rely solely on the Navy to organise amphibious operations, and secondly, that future landings would require both more speed and more force.[156] These requirements spurred the Army into developing a wide range of special landing craft, transports, and other equipment to fulfil this role. As a result of this development, and the Army's growing political dominance, the Army would gradually come to dominate amphibious development in Japan.

[153] Evans and Peattie, p. 441.
[154] Evans and Peattie, p. 441.
[155] Millett, p. 65.
[156] Millett, p. 65.

This dominance would see the Army develop its own fleet of troop transports, operated by the Rikugun Un'yubu (Army Transportation Department). This organisation had extensive ties into Japan's shipping industry and was responsible for the management of port facilities used by the Army, operating the Army's fleet of ships and landing craft, and conducting research into new designs of amphibious equipment.[157] Much of the research into new designs of ships and craft was done in co-operation with the Navy, although the Army had the resources to conduct this work alone.[158]

Beginning in 1920, the Japanese Army and Navy conducted a series of joint amphibious exercises. These exercises were conducted throughout the 1920s and routinely involved the landing of division sized forces. In 1926, the 5th, 11th, and 12th Divisions were assigned to the Rikugun Un'yubu for training in amphibious warfare. This was a result of these units being designated for an invasion of the Philippines in the event of a war between the United States and Japan.[159]

These exercises were used to work out the problems posed by amphibious operations. Techniques for conducting naval gunfire support, ship to shore movement, and communication and control were all tested. New types of equipment were also experimented with, such as new designs of landing craft and amphibian vehicles. The resulting experience gained from these exercises by the Army and Navy, was codified in 1932 in *Tairiku sakusen koyo* (Outline of amphibious operations). This document was the result of five years of deliberations by both services and clearly laid down the

[157] Millett, pp. 66-67.
[158] Millett, p. 67.
[159] Millett, p.67.

responsibilities of respective commanders at each level, and at each stage of any operation.[160]

The series of experiments with new equipment designs during these exercises had also yielded positive results. In 1930 the Japanese Army adopted into service the type 'A' landing craft. This purpose built craft had a shallow draft and a bow ramp and was, according to contemporary US Marine observers, "obviously designed to negotiate surf and shallow beach landings".[161] The value of such a craft for both assault landings and logistical purposes is immense, as in addition to having good 'sea keeping',[162] the ramp would allow the speedy unloading of troops or equipment. Neither the United Kingdom nor the United States had a comparable craft at that that time, and neither would develop one until the 1940s.

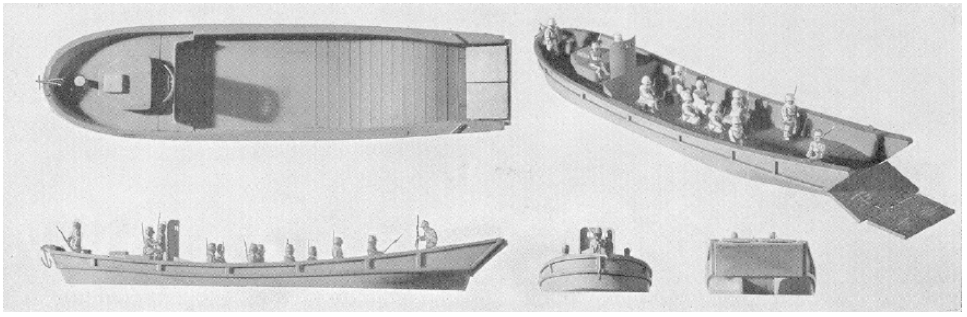


Photo 2. US Navy model of Japanese Daihatsu Landing craft. (Source ONI 225J)

The exercises of the 1920s had also revealed the need for a purpose designed amphibious warfare ship, the *Shinshu-maru*. Laid down in 1933 and completed in 1935, the *Shinshu-maru*, was able

[160] Evans and Peattie, p. 442-443, and Millett, p. 67.
[161] HAF Box 2, Folder 51, V. H. Krulak, *Report on Japanese Landing Operations Shanghai Area 1937,* Shanghai, 1938, p. 6.
[162] A term referring to the handling characteristics of a craft or ship at sea.

to handle thirty seven landing craft with its derricks and cranes.[163] Its stern doors allowed it to launch and recover landing craft at the rear of the ship, allowing it to function in a similar manner to a US Navy LSD (Landing Ship Dock). The *Shinshu-maru* was an advanced purpose designed ship, which had design features that would not be seen in United States or British ships until the 1940s.

Events in China would give both the Army and Navy the chance to test their amphibious forces in combat. The first opportunity occurred on January 28th, 1932, at Shanghai. After a series of incidents and provocations between Japanese and Chinese forces, fighting broke out between the Rikusentai garrison and Chinese forces. While the fighting at first only involved Navy forces, as the fighting intensified Army forces became involved to prevent the Navy garrison from being overrun.[164]

The Rikusentai performed very badly in the resulting street fighting, despite having air and naval gunfire support. The main reason for this was the limited training the Rikusentai had received in infantry operations. A US Marine analysis concluded that they "showed little knowledge of infantry tactics and failed miserably".[165]

Nor were the Rikusentai to fare better in conducting amphibious operations. On February 3rd, an attempt was made to seize the Chinese Woosung Fort. Control of this fort would give the Japanese free access to both the Yangtze and Whangpoo Rivers. Despite

[163] Evans and Peattie, p. 601.
[164] Evans and Peattie, p. 443.
[165] HAF Box,35, Folder 654, C. S. Oates, *A Critical Analysis of Japanese Operations against Shanghai in 1932, and the Results Thereof*, Quantico, 1935, p. 27.

naval gunfire support, the assault was repulsed “with considerable losses”.[166]

After continued bombardment from February 4th to February 6th, a further attempt was made to seize the fort. The results of the bombardment were minimal, due to the usage of armour piercing rounds.[167] Because these rounds were designed to penetrate the armour of an enemy warship, they lacked the explosive power necessary to destroy concrete fortifications. The need for high explosive rounds for bombardments had been recognised since exercises dating back to 1926,[168] but as these rounds were of limited use against enemy warships they were often not carried aboard in amounts sufficient for effective shore bombardment.

A mixed Army and Navy brigade of 3500 men was landed under the protection of naval gunfire some distance from the fort on February 7th. During the night of February 7th/8th, and throughout the day of February 8th, numerous attempts by the Japanese to cross Woosung Creek were repelled with heavy losses.[169] This was despite having air and naval gunfire support, and the usage of pontoon bridges to replace those the Chinese had burnt. Further attempts to seize the fort were abandoned, but the fort was subjected to aerial attack throughout the remainder of the fighting.

[166] Oates, p. 9.
[167] Oates, p. 9.
[168] Millett, p. 38.
[169] Oates, p.12.

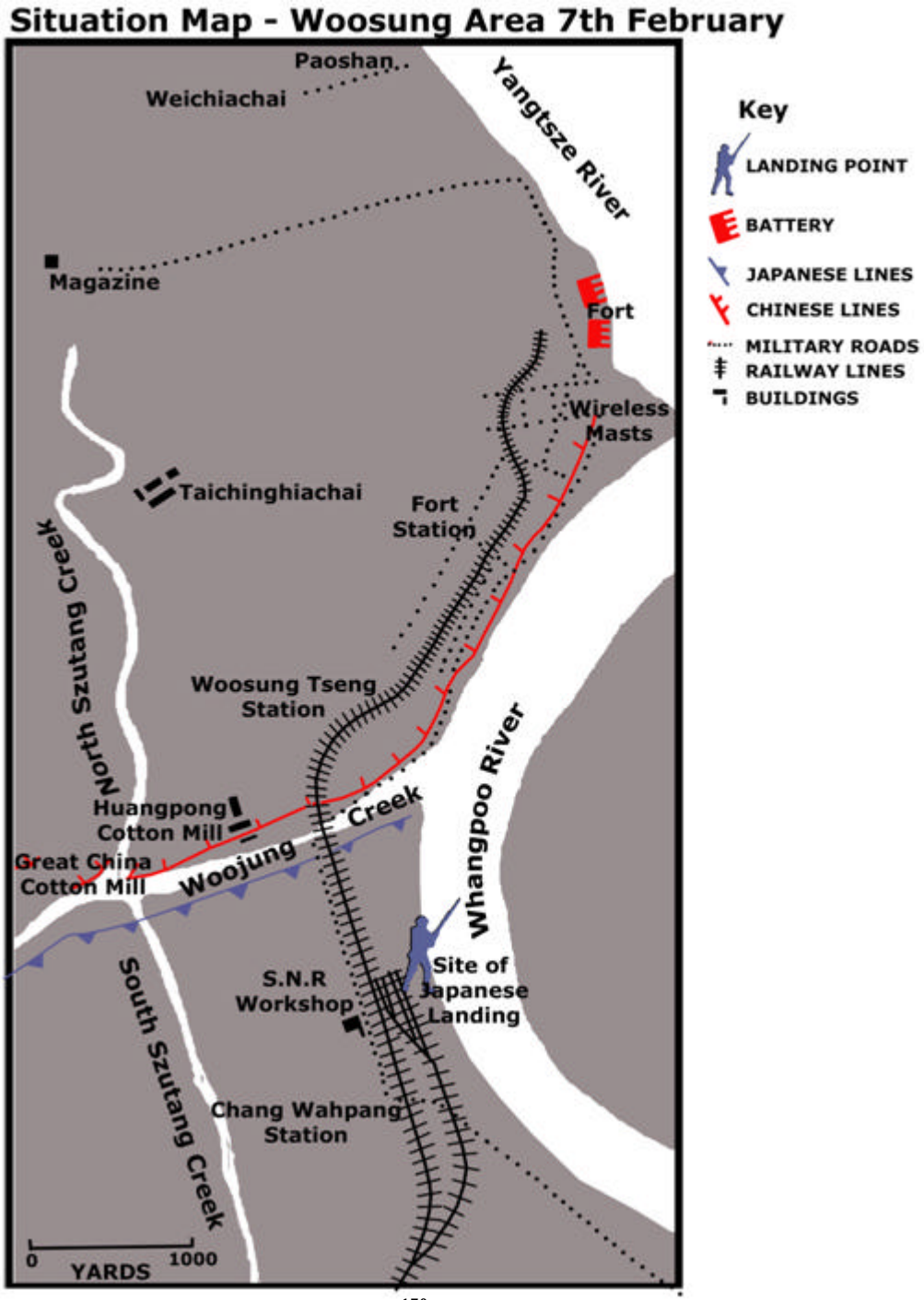


Figure 4 Situation Map Woosung Area.[170]

The fighting at Shanghai continued into May 1932, as both the Chinese and Japanese increased the forces involved. Eventually

[170] Based on map in HAF Box,35, Folder 654, C. S. Oates, *A Critical Analysis of Japanese Operations against Shanghai in 1932, and the Results Thereof,* Quantico, 1935.

the Japanese agreed to a truce restoring the January 28th positions, and withdrew the bulk of their forces by May 31st.[171]

While the disembarkation of the mixed brigade had been unhindered, the operation had failed to achieve its objective. Valuable lessons had been learnt by both services that would be incorporated into future training. The landing of the mixed brigade had been conducted by the Navy, and had left the Army unimpressed with the way the landing had been conducted. This was due to the Navy using unarmoured landing craft and transporting inadequate amounts of stores.[172] The Navy was unimpressed with the performance of its ground troops and took steps to remedy the situation. This involved the formation of permanent SNLPs (Special Naval Landing Party). These units, named after their respective home bases, were the size of a reinforced infantry battalion,[173] with an organic heavy weapons company equipped with light artillery. In effect the Navy created its own standing army, which was equipped and trained along the same lines as Army units.[174] Despite the Navy's ground forces becoming virtual copies of the Army's forces in terms of equipment and tactics, the Navy continued to deploy its amphibious forces from its warships, rather than the specialised ships used by the Army.[175]

Joint exercises between the Army and Navy would continue into the 1930s, with the role of the Navy shrinking into one of providing convoy protection and naval gunfire support. While the Army would develop a range of transport ships, and landing craft for its

[171] R. M. Stanley, *Prelude to Pearl Harbor*, New York, 1982, p. 18.
[172] Evans and Peattie, p.443.
[173] 1,069 Officers and men.
[174] Millett, p. 69.
[175] Millett, p. 70.

amphibious forces, the Navy relied on transporting its SNLPs on warships that would be better suited to supporting the rapid operations envisioned by the Navy.[176]

The outbreak in 1937 of the Second Sino-Japanese War would see the employment of both the Navy's and the Army's amphibious forces. The Japanese were able to quickly wrest control of China's coastal waters with their superior navy.[177] The resulting blockade enabled the Japanese to land forces at will on suitable locations on China's coast. While this gave the Japanese the freedom to land forces at undefended locations on the Chinese coast, it was sometimes necessary for the Japanese to conduct opposed landings over the next three years.

While the Japanese were ultimately successful in all of these operations, this success was sometimes only the result of grim determination. The landing at Liuho, in 1937, was strongly opposed, with success only resulting after the third attempt.[178] Likewise, early efforts at Shanghai were rebuffed and only succeeded after the commitment of more resources.[179] The willingness of Japanese commanders to sustain heavy casualties in order to achieve objectives, and the zeal of Japanese troops to sacrifice themselves in the Emperor's name would become legendary. However, as the firepower and quality of their opponents increased, this would result less in success, and more in slaughter.

[176] Evans and Peattie, p. 443.
[177] H. Long-hisuen, and C. Ming-kai, *History of The Sino-Japanese War,* Taipei, 1972, p. 263.
[178] Krulak, *Report on Japanese Landing Operations*, p. 1.
[179] Stanley, p.102.

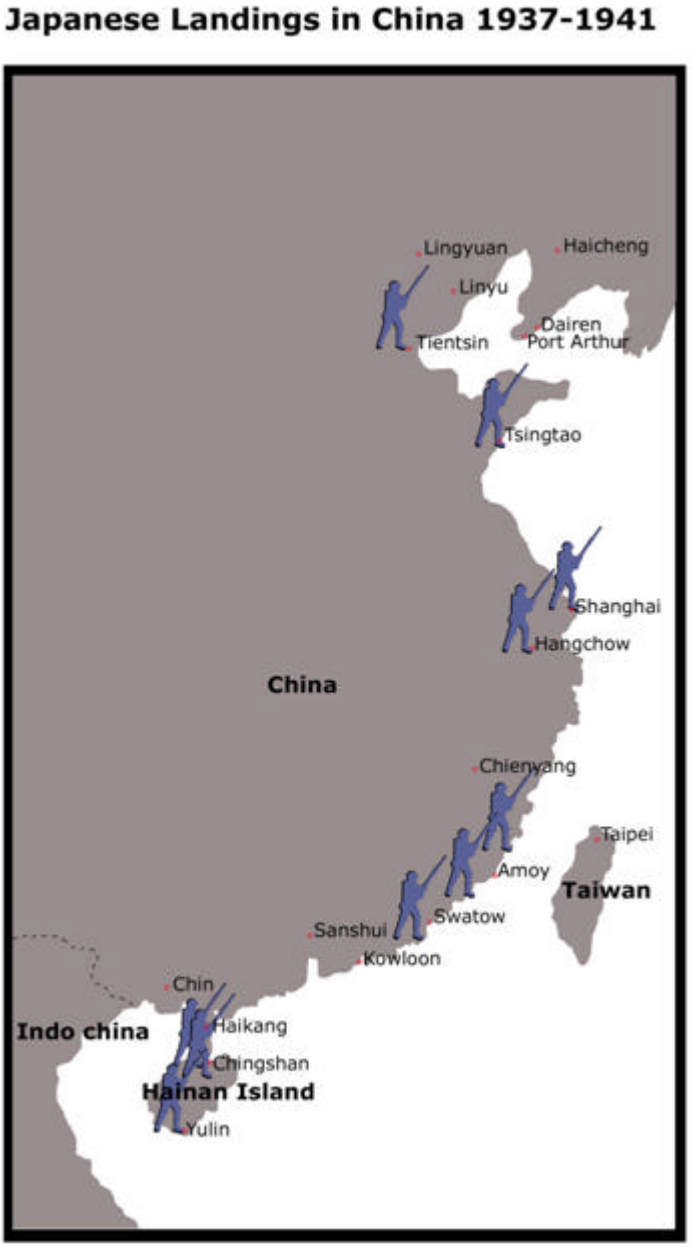


Figure 5. Japanese Landing Operations in China. [180]

As the war in China changed from the short war initially planned, the demand for more men and materiel increased in order to break the deadlock. As a result of this increased commitment, more

[180] Based on information in H. Long-hsuen, and C.Ming-kai, *History of The Sino-Japanese War (1937– 1945)*, Taipei, 1972.

Japanese divisions were sent to China.[181] This increased deployment included the release of the Army's three amphibious trained divisions for service in China. As the scale of the fighting increased around Shanghai one of these divisions, the 11th Infantry Division, sustained heavy casualties. The Army high command felt this was a result of concentrating on amphibious training at the expense of other more traditional training.[182] As a result, no more divisions would receive specialist amphibious training.

This development was also partially due to the success that the Japanese had in conducting unopposed landings in the traditional pattern. The war in China had shown the Japanese that while it was still necessary to conduct the occasional opposed landing, it was also possible with naval and aerial supremacy to conduct unopposed landings. Since every landing would no longer necessitate an Asian Gallipoli, it was no longer believed necessary by the Army high command to train divisions to the same high standard of amphibious operations as previously thought, as such the number of specialist amphibious trained divisions was dropped from three to just one.[183]

The success of German paratroopers in Norway and the Low Countries during 1940 inspired the Japanese to develop their own airborne forces.[184] While both the Army and Navy developed airborne units, the Navy units were intended to assist in the seizing of naval bases and in amphibious assaults.[185] The Navy planners

[181] E. P. Hoyte, *Japan's War: The Great Pacific Conflict 1853-1952*, London, 1987, p. 154.
[182] Millett, p. 68.
[183] E. J. Drea, "The Development Of Amphibious Warfare Doctrine", in *In The Service Of The Emperor: Essays on the Imperial Japanese Army*, Lincoln, 2003, p. 25.
[184] G. Rottman, and A. Takizawa, *Japanese Paratroop Forces of World War II*, Oxford, 2005, p 4.
[185] Rottman and Takizawa, p. 7.

were not blind to the advantages that a vertical envelopment could provide in an amphibious assault, a function now provided in modern operations by the use of helicopters.

With the German successes of 1940, and the continuing economic measures taken against Japan by the US, the Japanese turned their strategic focus away from China, and the Russian Far East, towards the virtually undefended European colonies of South East Asia. With Britain committed to a European war it was not winning, the Japanese believed that this opportunity, combined with their amphibious capacity, would result in speedy victories and a short war.

As a result of the intensive training and development during the years 1919 to 1941, and the wartime experience gained in China, the Japanese had considerable amphibious capability. By 1941, the Japanese were the world's leading practitioner of amphibious warfare. They had the most advanced equipment, they had nearly two decades' worth of experience in conducting division sized landing exercises, and they had conducted several successful wartime operations in China. The Japanese military thus had justification to believe that future operations would be just as successful. The Japanese military believed that any future amphibious operations would not pose any problems that had not already been solved as a result of experience gained in exercises or wartime operations. Buoyed by this confidence, a military mission was sent to German occupied France in 1940 with the purpose of offering the Germans advice in the planning of Operation Sealion, the invasion of England. Fortunately for the

British, the Germans did not accept the offer of Japanese assistance.[186]

United States Exercises and Developments

Unlike Japan and Britain, the United States had not conducted a wartime amphibious operation since the Spanish American War in 1898. Despite this lack of recent experience in conducting amphibious operations, the United States was to produce a comprehensive doctrine for the conduct of amphibious operations that would provide the underpinning principles for all United States amphibious operations in World War Two.[187] However, while this doctrine was able to provide the theory, many of the technical solutions required to fully enact it were not developed until after the beginning of the Pacific War.

The process of developing United States amphibious doctrine began with the assumption of the amphibious spearhead role by the United States Marine Corps (USMC) as its raison d'être. This occurred as a result of US Marine officers seeing such a role being the natural employment of the corps,[188] and the importance of such operations to the successful outcome of War Plan ORANGE.[189] The importance of controlling secure anchorages in the various incarnations of ORANGE[190] led to the US Marines having the opportunity to create a niche role as the amphibious force required to secure the required anchorages. The adoption of this role had

[186] Evans and Peattie, p. 601.
[187] J. A. Isely, and P. A. Crowl, *The U.S. Marines And Amphibious War: Its Theory, and Practise in the Pacific*, Princeton, 1951, p. 4.
[188] H. M. Smith, and P. Finch, *Coral and Brass*, New York, 1949, p. 50. and Millett, p.72.
[189] ORANGE was the code colour given for Japan. All US War plans were colour coded.
[190] For an indepth discussion on the development, evolution, and execution of the ORANGE WARPLANS, see E. S. Miller, *War Plan Orange: The U.S Strategy to Defeat Japan, 1897 – 1945*, Annapolis, 1991.

tangible benefits for the US Marine Corps as it would justify the continued existence of the corps against repeated US Army attempts to absorb it during periods of slim military budgets.[191]

While the United States had ended World War One as a creditor nation, its strategic position in the Pacific had deteriorated with the acquisition by Japan of strategic island groups which were formerly German territories. The United States 'Open Door' policy in China was also threatened by the Japanese assumption of German territorial concessions in China. Coupled with the development of oil fired ships with both greater range and ease of replenishment than their coal fired predecessors, the United States was faced with a radically different strategic environment than had existed prior to World War One.

This resulted in a reevaluation of War Plan ORANGE, and its operational requirements. In 1921, USMC Major Earl H. Ellis conducted a study of how and where this possible war would be fought, and what the role of the US Marines was to be in this conflict. The resulting report, codified as Operational Plan 712 *Advanced Base Operations in Micronesia*, plainly outlined what Ellis viewed that role as,

"In order to impose our will upon Japan, it will be necessary for us to project our fleet and land forces across the Pacific and wage war in Japanese waters. To effect this requires that we have sufficient bases to support the fleet, both during its projection and afterwards. As the matter stands at present, we cannot count upon the use of any bases west of Hawaii

[191] F. O. Hough, V. E. Ludwig, and H. I. Shaw, *Pearl Harbor to Guadalcanal: History of U.S. Marine Corps Operations in World War II Vol. I,* Washington, n.d., p. 10. and Millett, p. 72.

except those which we may seize from the enemy after the opening of hostilities."[192]

Ellis also outlined the structure of the force needed to achieve such a role. The US Marines then began a process of tailoring itself both structurally and doctrinally towards achieving this goal. The existing doctrine for amphibious operations was extremely limited in its scope and inadequate for achieving the objectives of ORANGE.[193] Simply put, the methodology to conduct major amphibious operations did not exist, and neither did the equipment. In order to correct these shortcomings, the US Marines embarked on a program of staff studies and practical exercises.

The 1920s saw a variety of techniques and equipment tested during exercises. These experiments were often marked by mistakes with the planning and coordination of the forces involved,[194] but these failures resulted in the US Marines gaining valuable information about amphibious operations. These experiments were also helped by knowledge the US Navy had gained from the Royal Navy during World War One. Despite the failure of Gallipoli the Royal Navy had continued to plan for further amphibious operations, and experiment with designs for new landing craft. During the period of closeness the two navies had experienced during the later part of the war, this knowledge had been passed on to the US Navy.[195]

To facilitate the training required to achieve the operational requirements of ORANGE, training grounds on the Puerto Rican

[192] E. H. Ellis, *FMFRP 12-46 Advanced Base Operations in Micronesia*, Washington, 1992, p. 42.
[193] H. I. Shaw, *Opening Moves: The Marines Gear Up for War*, Washington, 1991, p. 3.
[194] Hough, Ludwig, and Shaw, p. 10.
[195] N. Friedman, *U.S Amphibious Ships and Craft: An Illustrated Design History*, Annapolis, 2002, p. 17.

islands of Vieques and Culebra were acquired in 1923. The selection of these islands was a result of their geographical similarity to Japan's newly acquired Pacific Mandates.[196]

1924 saw the US Marines testing the Christie amphibious tank, while exercises in 1925 were based on the Gallipoli campaign and its assorted problems. The resulting expanded skill base of the Marines saw them being assigned in the 1927 edition of the *Joint Action Of The Army And Navy* manual the wartime mission of conducting land operations in support of the fleet including the initial seizure and defence of advanced bases.[197]

Despite the codification of the Marines' amphibious role in *Joint Action*, the series of amphibious exercises ended that year with the deployment of Marine forces to both Nicaragua and China.[198] This deployment required the bulk of Marine troop strength with insufficient troops left to conduct further amphibious exercises. When US forces were withdrawn from Nicaragua in 1933, and with the provision in the 1933 edition of *Joint Action* for the Marines to conduct opposed landings, the US Marines gained both the opportunity and the mandate to reorganise itself into the Fleet Marine Force (FMF). Traditionally the Marines had been divided into small discrete self contained units. The new FMF organisation placed the Marines into one command more suitable for deployment as an amphibious task force.[199]

This process of organisational change was as a result of changes being made to the US Marines' amphibious doctrine. In 1931 the

[196] Smith and Finch, p. 55.
[197] USMC, *Marine Corps History,* Quantico, 1962, p. 39.
[198] Millett, p. 74.
[199] J. A. Isely, and P. A. Crowl, *The U.S. Marines And Amphibious War: Its Theory and Its Practice in the Pacific*, Princeton, 1951, pp. 33-34.

US Marines created a board of marine officers, and one US Navy officer, with the task of producing a text on amphibious warfare. The deliberate inclusion of a US Navy officer was in order to gain the naval point of view of amphibious operations and create an informal channel of communications for discussion of the boards work within the US Navy. The intent was to create a work that would serve as an official US Navy doctrinal publication. [200]

The board was assisted in its task by both the staff and students of the Marine Officers School at Quantico. The normal course-work was temporarily suspended, as the school became a think tank dedicated solely to solving the problems posed by amphibious operations. By a process of reviewing the experiments and exercises of the 1920s, and reverse engineering the mistakes of the Gallipoli campaign,[201] the Marines identified several key areas of importance to planning an amphibious operation. These areas were the command relationships within the task force, naval gunfire support, air support, ship to shore movement, combat unit loading, and the usage of shore parties. Together these formed the basis of the chapters contained within the 1935 *Tentative Manual of Landing Operations*.[202] However, despite this comprehensive approach to the problems posed by amphibious operations, it was recognised by both the US Marines and US Navy that much work was still required, resulting in the revival in 1935 of the Fleet Landing Exercises (FLEXs) to test and expand on these concepts.

[200] HAF 43 *Text for Landing Operations 1931*, letter from The Major General Commandant To The Commandant Marine Corps Schools, 20th October 1931.
[201] J. H. Alexander, *Storm Landings: Epic Amphibious Battles in the Central Pacific*, Annapolis, 1997, p. 12.
[202] HAF Box 7, Folder 180, Anon., *Tentative Landing Operations Manual*, Washington, 1935, pp. i-ii.

1935 also saw the production of a US Army General Staff Study, *Historical Study of Landing Operations*, by the then Colonel G.S Patton.[203] This study was an analysis of nineteen amphibious operations ranging from Sir Francis Drake at Cartagena, Columbia in 1588, to the then recent Japanese operations at Shanghai in 1932. Patton noted a correlation of certain factors occurring in successful operations, and compiled a list of factors likely to occur in successful operations. Essentially this list of factors was a restatement of the traditional view that success was most likely to occur in unopposed la ndings on suitable beaches.

Patton however did not endorse this view, nor refute it, instead stating that the study had derived no conclusions "due to the impropriety of circulating these conclusions in a summary of this nature".[204] One conclusion that Patton did state was a departure from the US Army preference for having landing ships beach ashore in the manner of the *SS River Clyde* at Gallipoli, or later LSTs.[205] While beached the ships would be vulnerable, but this was considered an acceptable risk in light of the benefits to be gained by the resultant speed and ease of unloading.[206] Patton argued instead for the usage of small armoured craft in the initial wave of a landing so as to disperse enemy fire across a multitude of targets, as opposed to having enemy fire concentrated on fewer higher value targets.[207] US Army views on amphibious operations were still firmly tied to the earlier traditional model of operations.

[203] General Patton would command the US Western Task Force during Operation TORCH, the Allied invasion of North Africa in 1942.
[204] G. S. Patton, *Historical Study of Landing Operations*, Fort Shafter, 1935, p. 34.
[205] Landing Ships Tank.
[206] Friedman, p. 20.
[207] Patton, p. 34.

While the US Marines were clearly in the forefront of amphibious development, amphibious operations were still of interest to the US Army, with the US Army Command School at Fort Leavenworth collecting information and reports on foreign operations. As the role of the command school was to train officers in the use of large formations of ground forces, a number of Marine officers were posted there during the period that the *Tentative Manual of Landing Operations* was created.

Two of the operations that the command school had gained detailed information on were Operation Albion, the 1917 German campaign against Russian held Baltic Islands, and the 1925 Franco Spanish landing at Alhucemas Bay. These two operations should have been of special significance to the US Marines as they were successful operations conducted in the face of opposition from a hostile shore – exactly the type of situation the Marines were expecting to encounter in future operations in the Pacific.

These two operations drew much from the mistakes of Gallipoli in their planning. While neither operation faced opposition on the scale of Gallipoli, they solved in their planning and execution many of the issues of command, control, communications, logistics, naval gunfire support, and ship to shore movement that had bedevilled the Gallipoli campaign. Many of the principles outlined as being vital to the success of these operations appear in the US doctrine laid down in the *Tentative Manual*.

While no direct mention is made of these reports or these operations in the development of the US Marines doctrine, this material was available at Leavenworth during the creation of the *Tentative Manual*. Given that these operations are examples of

post Gallipoli successful opposed landings, and that the reports on these operations can be found in US Marine archives, it is reasonable to assume that the creators of the *Tentative Manual* were aware of them and possibly influenced by them.

The resumption of FLEXs in 1935, to be conducted on an annual basis, was to mark a period of intense review and testing of the *Tentative Manual* before it was accepted by the US Navy as an official doctrinal publication in 1938[208] as *FTP 167 Landing Operations Doctrine United States Navy 1938*.[209] The process of experimentation did not end with the adoption of this document. Further changes were made in 1941 with a major revision of *FTP-167* occurring as a result of feedback from experiences in FLEXs. Changes included the recommendation that LVTs be used for crossing coral reefs and transporting men and materiel directly inland without unloading on the beach.[210] Other changes included additional material on the role of aviation in amphibious operations,[211] and the inclusion of a section on salvage operations conducted during a landing.[212] Tactical air support of amphibious operations was aided by the decision that Marine pilots were to receive infantry training in order to increase their appreciation of ground combat resulting in smoother integration of air power in amphibious operations.[213]

Despite the advances that the US Navy and Marines made in doctrinal development, serious deficiencies remained in the equipment available. With each successive FLEX it became

[208] Hough, Ludwig, and Shaw, p. 14.
[209] US Navy, *FTP-167 Landing Operations Manual*, Washington, 1938.
[210] HAF Box 34, Folder, 638(5), Anon., *Tentative Changes In FTP-167*, n.p., 1940, p.2.
[211] Ibid., pp.7-17.
[212] Ibid., pp.21-24.
[213] Isely and Crowl, p. 33.

abundantly clear that standard Navy ships boats were unsuitable for landing operations and that specialised equipment was necessary, as was the employment of specialised transport ships rather than Navy warships.[214] US Navy planners were not unaware of the pitfalls of using warships as transports and had planned in wartime to mobilise civilian ships of the US merchant fleet to act as transports and other fleet auxiliaries. Unfortunately, by 1930 the US merchant fleet was both old and slow, with few ships fast enough for naval use. The formation of the Maritime Commission in 1936 was to enable the production of merchant ships to standard designs that could be easily converted to useful transports and auxiliaries in wartime.[215]

The provision and procurement of specialised landing craft and other amphibious equipment could not be so easily solved. A great deal of interest was displayed in the appearance of Japanese landing craft in 1937.[216] These shallow drafted, bow ramped, and armoured landing craft were far in advance of anything in US inventories at the time. Despite this interest, and technical advice rendered by friendly Japanese officers,[217] the United States would not produce a craft with similar features until 1941.

Advances were made in the acquisition of other equipment. The creation by Donald Roebling, in 1937, of an amphibian tractor for use as a rescue vehicle in the swamps of Florida attracted the

[214] HAF Box 3, Folder 73, B. W. Gally, *A History of the U.S. Fleet Landing Exercises*, n.p. 1939, p. 10.
[215] Friedman, p. 7.
[216] A number of reports were produced on these craft and their employment such as; HAF Box 4, Folder 127, M. G. Brown, *Japanese Special Landing Force Boats And Boat Ships*, n.p. 1937, HAF Box 2, Folder 51, V. M. Krulak, *Report On Japanese Landing Operations Shanghai Area 1937*, Shanghai, 1938, and HAF Box 4, Folder 125, Anon., *Japanese Landing Boats Shanghai, 1937: Data Collected by USS BULMER*, n.p., 1937.
[217] HAF Box 4, Folder, 123, V. H. Krulak., *The design and Procurement of Suitable Landing Boats*, n.p. , 1939, p. 15.

attention of Marine officers who saw the potential of such a vehicle. After extensive testing and modifications to meet both Navy and Marine standards the Roebling tractor was adopted in 1941 as the LVT1,[218] for use as an amphibian supply vehicle.[219]

The US Army's involvement with FLEXs was limited to sending teams of observers until FLEX 3 in 1937, when it sent 61 officers and 731 enlisted men to take part in the landing operations. FLEX 4 saw the Army send 42 officers and 547 enlisted men to take part in a series of landings which involved the landing of light tanks and air support in an exercise far in advance of previous FLEXs.[220]

The Army was also absent from FLEX 5 in 1939, but a form of amphibious training was conducted by General Frank Keating with a series of simulated landings known as the 'Alfalfa assaults'. Elements of the 15th Infantry Regiment were loaded in trucks, taken to an alfalfa field, unloaded, and advanced through the alfalfa towards a simulated shoreline.[221] The Army's alternate exercise to FLEX 6 was a landing exercise in Puget Sound involving a division of 9000 men and 1100 vehicles loaded on Army transport and cargo ships. The Navy was to provide warships to act as support for the landing, and escort for the convoy. The exercise quickly degenerated when it became apparent that the crews of the Army ships were unaware of Navy convoy procedures and their cargoes were not combat loaded. In addition the Navy warships only carried sufficient small boats to land 1550 of the 9000 troops afloat. As a

[218] Landing Vehicle Tracked.
[219] S. Zaloga, *Amtracs: US Amphibious Assault Vehicles*, London, 1987, p. 4.
[220] Gally, pp. 7-10.
[221] Friedman, p. 20.

result the exercise became a transport operation with the division being taken to Monterey.[222]

Despite its collection of data on foreign operations, the US Army's operational knowledge and experience of amphibious operations was still minimal. The events of the Munich Crisis made the Army view a future European war as more likely, and realise that it might not be able to rely on the usage of friendly ports. This realisation, coupled with the results of its own exercises and developments, led to the adoption in 1941 of *FTP-167* as Army manual *FM 31-5 Landing Operations on Hostile Shores*.[223] Because of the advances made by the US Navy and Marines, it was possible to set up training centres where Marine instructors initially trained the Army personnel. The adoption of *FTP-167* allowed the Army to walk in the footsteps of both the Navy and Marines without the lengthy development process that had resulted in its creation. The United States had created the blueprints for amphibious operations, all that remained was to create the tools.

Preparing for War

When the Pacific War began, Britain found itself in the midst of a European war, in which its forces had been expelled from the continental mainland, and had seen its continental allies conquered. Britain's interwar focus on the techniques needed for fighting a European war had resulted in amphibious development receiving a low priority. As such, limited defence funds had been spent on other more urgent priorities such as the modernisation and expansion of the Royal Air Force. However, the prewar neglect of amphibious operations resulted in Britain having to rebuild its

[222] Friedman, p. 20.
[223] Hough, Ludwig, and Shaw, p. 14.

amphibious capabilities on a timetable dictated by the changing fortunes of war.

The eve of the Pacific War saw Japan in possession of a formidable amphibious striking force, capable of conducting multiple operations virtually simultaneously. This force was battle seasoned, and well equipped with specialised landing ships and equipment. The demands of the war in China had blunted the edge of this force as the Army was forced to use its dedicated amphibious divisions in the conventional infantry role. The losses suffered by these three divisions in China resulted in the cessation of specialised amphibious training by the Japanese Army. This meant that the loss of institutional memory amongst the rank and file of these specialist divisions – the personnel who would actually conduct the landings – was not replaced by new amphibious trained personnel. This reduction in the pool of amphibiously trained soldiers, while not removing Japan's amphibious capability, must have reduced it.

The United States had also developed a respectable amphibious striking force as a result of the US Marines transforming themselves into a dedicated amphibious force. While the United States lagged behind the Japanese in terms of landing ship and craft design, they were actively closing the gap. In other areas of equipment the United States had seized the lead, such as in mechanised amphibian vehicles. The adoption of the Roebling tractor was to provide the US Marines with a vehicle capable of crossing the coral reefs found around many of the islands identified as vital to ORANGE's success. The Roebling tractor would also serve as the foundation for a generation of truly amphibian tanks

and armoured personnel carriers that were to enter service in World War Two.

The biggest achievement of the United States during the interwar period was the creation of a robust amphibious doctrine. This doctrine, while amended in detail by operational experience during the war, was to codify the principles that are the foundation of all modern amphibious operations. This achievement would ultimately serve to both overshadow Japan's technical achievements and assist in the rebuilding of Britain's amphibious capabilities.

Chapter Four Development of Equipment

During the Pacific War a vast array of different types of equipment were produced by all the major combatant nations. By 1945 the Allies had produced no fewer than 117 different types of landing craft, barges, ships, and amphibian vehicles, designed for conducting amphibious operations.[224] Nor were the Allies alone in producing multiple equipment types. By 1943 the Allies had identified 8 main types of landing craft alone in Japanese service.[225]

Amphibious operations also necessitated the involvement of other forms of equipment apart from that used to transport the landing force from its ships to the shore. Equipment used for conducting amphibious operations could thus fall into one or more of the following broad categories:

- Ships used to transport the landing force and its supplies to the landing area.
- Warships used to provide naval gunfire support, airstrikes, and a defensive screen for the fleet and the landing zone.
- Aircraft used to provide airstrikes, air defence, and observation.
- Ships used to provide command, control, and communication facilities.
- Ships, craft, and amphibian vehicles used to transport troops, equipment, and supplies, onto the landing zone.

[224] *ONI 226/1 Allied Landing Craft and Ships: Supplement No 1* , Washington, 1945, pp 2-3, reprinted in A. D. Baker, *Allied Landing Craft of World War Two*, London, 1985, hereafter ONI 226/1.
[225] *ONI 225 Japanese Landing Craft Equipment and Operations*, Washington, 1943, pp. 14-23, hereafter *ONI 225 J*.

- Amphibian vehicles used to provide fire support for the landing force.
- Specialist combat engineering vehicles and equipment.
- Specialist logistics equipment.
- Hospital ships and medical facilities.

Whilst all these differing forms of equipment were often vital to the success of a landing operation, other factors were the catalyst for their development. For example the development of aircraft used by both sides to contest air superiority over a landing site was driven by the demands the war placed on all aspects of aerial combat, not just the demands created by amphibious operations. Likewise, the improvements to infantry small arms used in amphibious landings were the result of advances made to increase the firepower of the infantryman in all combat situations.[226] To fully explore all these various factors in full would be beyond the scope of this study which is limited to looking solely at those developments which were necessitated by the requirements of amphibious operations, either as a result of doctrinal requirements or operational experience gained during the war. As such the primary focus will be on landing ships, landing craft, and amphibian vehicles.

Traditionally the difference between a landing ship and a landing craft is that the landing ship is able to transport itself across the sea to the landing zone, whereas the landing craft has to be transported to the landing zone and then launched into the water and be able to be beached on the shore.[227] This traditional distinction was changed during World War Two with the development of landing

[226] For an excellent reference on the development of infantry small arms in WW2 see I. V. Hogg, *The Encyclopedia of Infantry Weapons of World War II,* London, 1977.
[227] J. Atkinson, *Landing Craft from 1926*, n.p., n.d. , p.1

craft with ranges of over 1000 miles,[228] and of landing ships that were designed to beach and discharge their cargo directly on the shore.[229]

The changing nature of amphibious equipment was driven partially by doctrinal requirements, partially by operational experience, and partially by strategic necessity. The Japanese, the United States, and the United Kingdom had all identified the basic requirements for amphibious equipment during the interwar period. The degree to which these requirements had materialised into useful equipment by the beginning of the Pacific War varied greatly.

The basic requirements were for ships that had the speed and endurance to operate with the rest of the fleet, whilst able to transport a reasonable number of landing craft into the area of operations. For landing craft the basic requirements were for a fast craft with a low centre of gravity capable of beaching itself on the shore.

At the beginning of the Pacific War only Japan had sizeable numbers of ships and craft in service meeting those requirements. Both the United States and the United Kingdom lagged behind Japan, but by war's end they had surpassed Japan in both technical achievement and in sheer scale of production.

[228] The LCI (L) had an endurance of 1500 miles at 12kts, and the LCT (8) an endurance of 2500 miles at 10kts. While both craft carried light anti aircraft weapons, without an escorting warship they were quite vulnerable to attack. See respective entries in *ONI 226* for further details.

[229] The LST and LSM were both designed to beach and unload their cargoes via their large bow doors.

Type	Nationality	Number Produced
Shinshu Maru Landing craft carrier	Japanese	1
Akitsu Maru Landing craft carrier	Japanese	2
T103 Class Fast Transport	Japanese	63
Daihatsu Landing Craft	Japanese	3229
LSD	American	25
LST 2	American	982
LCI(L)	American	1000
LCVP	American	22,492
LSI(L)	British	
LST 1	British	3
LCM 1	British	30
LCA	British	2030

Table 1. Total wartime production of most common landing ships and craft.[230]

All three powers in this study displayed considerable innovation in their technical developments. During the interwar period, a series of military exchanges and cordial relations between members of each nation's armed services facilitated the free exchange of ideas and information. Japanese forces operating in Shanghai during 1937 freely showed off their landing craft to USMC Officer Victor Krulak, and even contributed to his report on these craft to his headquarters.[231]

This interchange of ideas continued during the Pacific War, but the form in which it occurred changed. Exchanges of ideas between the Allies and Japan were the result of capturing or observing enemy equipment, while exchanges between the United States and the United Kingdom involved key designers such as the United States' boat builder Andrew Higgins developing a close working

[230] Friend and Gardiner, pp. 149-150.
[231] Krulak mentions a particularly helpful officer by name in the report's acknowledgements.

relationship with British naval constructor Rowland Baker during the visits of British technical missions to the United States.[232]

Rowland Baker was appointed during the war to supervise the design and construction of amphibious vessels in British service. Under his supervision, the Royal Corps of Naval Constructors maintained smooth working relationships with private ship and boat building firms. This was in stark contrast to the acrimony which existed between the US Navy's Bureau of Ships (BuShips) and some of its contractors, most notably Andrew Higgins of Higgins Industries. This smoother and less problematic approach to amphibious design allowed the British to make rapid developments despite starting later than the United States.

British Developments 1940 – 1945

The interwar development of amphibious equipment by the United Kingdom was greatly hampered by the official view that amphibious operations were unlikely to occur in any future European war. This official view was bolstered by theorists such Liddell Hart who viewed amphibious operations as being virtually impossible due to the vulnerability of amphibious forces to enemy airpower.[233]

The small amount of development that did occur happened under the direction of the Landing Craft Committee.[234] This committee, set up in 1921, had the task of creating craft capable of meeting the requirements of both the Admiralty and the War Office. The

[232] D. K. Brown, "Sir Rowland Baker, RCNC", in *Warship 1995*, London, 1995, p. 145.
[233] J.H. Alexander, "Across the Reef Amphibious warfare in the Pacific", in *The Pacific War: From Pearl Harbor to Hiroshima*, Botley, 2006, p. 198.
[234] B. Friend and R. Gardiner, "Amphibious Warfare vessels" in *Conway's History Of The Ship: The Eclipse of the Big Gun: The Warship 1906-45*, London, 1992, p.141

resulting craft, Motor Landing Craft (MLC 1 and MLC 10), were flawed from the start due to the errors in these requirements.[235]

These requirements were that the MLCs had to be transportable on existing troop ships, be lightweight, and had to be capable of unbeaching themselves. Using a complicated pump arrangement that used jets of water to dislodge the craft from the beach solved this prerequisite. This resulted in a craft with both low power and poor endurance.[236]

The worst feature of the design was the placement of the cargo deck above the waterline. While this allowed ease of loading and unloading similar to a modern 'roll on - roll off' ferry, it also resulted in a very high centre of gravity. When loaded the craft had an even higher centre of gravity that had dramatic implications for the craft's stability at sea. During a trial conducted in the mid 1930s, five MLCs were ballasted to simulate a full load and put under tow from a destroyer to establish if the low speed of the underpowered craft could be overcome by towing. The result was that all five craft capsized and the design was abandoned.[237]

British interwar experimentation with amphibian tanks also yielded similar disappointing results, with no vehicle being accepted into British service. As these designs largely utilised flotation pontoons, the resulting prototypes were generally small with limited armament and light armour and usable only in calm water.[238] Other nations were interested in the British designs, with production models of the Carden Lloyd Light Amphibious Tank being sold to the USSR,

[235] Brown, p. 142.
[236] Brown, p. 142.
[237] Brown, p. 142.
[238] D. Fletcher, *Swimming Shermans: Sherman DD Amphibious Tank of World War II*, Botley, 2006, p.4.

Japan, Thailand, and the Netherlands, in 1932.[239] The British would not renew interest in the development of amphibian tanks until World War Two with the adoption into service of the Duplex Drive system.[240]

With the establishment of the ISTDC at Portsmouth in 1938, development of two new types of landing craft began. These craft were to have a simpler design and avoid the pitfalls of the MLC's.[241] The two new craft were designed by British firm Thornycrofts and were to be the basis of the successful wartime Landing Craft Assault (LCA), and Landing Craft Mechanized (LCM).[242]

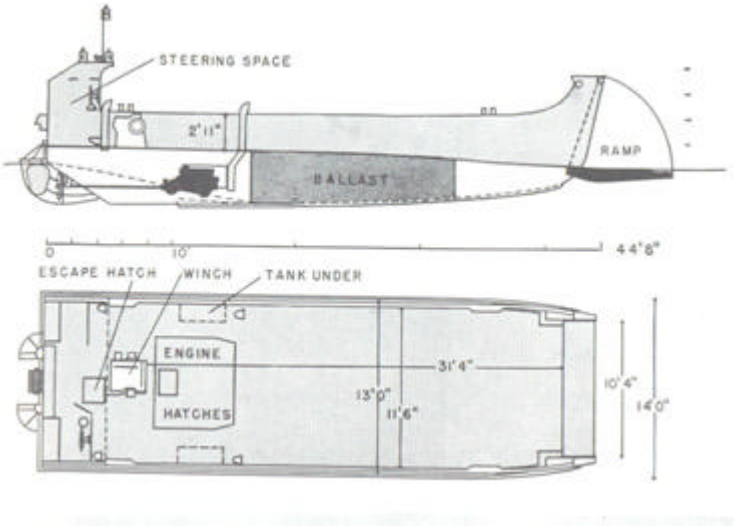


Figure 6. drawing of LCM 1 (ONI 226)

[239] HAF Box 39, Folder 718A-C, Borg-Warner Corporation, *Research, Investigation & Experimentation in the Field of Amphibian Vehicles*, Kalamazoo, 1957, p. 28.
[240] For a detailed description of the Duplex drive system see I. V. Hogg and J. Weeks, *The Illustrated Encyclopedia Of Military Vehicles*, Sydney, 1980, p. 309-310.
[241] Brown, p. 142.
[242] At the time the prototypes were known respectively as Assault Landing Craft (ALC) and Mechanised Landing Craft (MLC). For ease of clarity the more familiar standardised titles will be used throughout this study.

The first prototype of LCA was ready in august 1939,[243] but production was initially limited due to higher defence priorities. While the fall of France in 1940, and the expulsion of the British from the continent, would result in landing craft production gaining a higher priority due to a vastly different strategic environment, it was still necessary to use World War One vintage X-Lighters to support early operations in North Africa.[244]

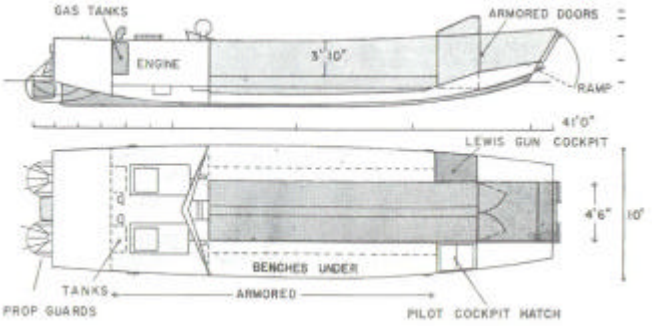


Figure 7. Picture of LCA (ONI 226)

Shortages of equipment in the aftermath of Dunkirk even affected raiding operations. The first commando raid launched against the Germans used RAF rescue launches instead of landing craft as no landing craft were yet available. In the aftermath of the fall of France even the availability of small arms to conduct training for operations was limited. [245] However, once landing craft were available to equip the commando raiding units, they were increased from a troop of 47 men and 3 officers into a troop of 60 men and three officers, thus fitting "exactly into two landing craft."[246]

The LCA was armoured to protect the crew and passengers from small arms fire. It also featured overhead protection from aircraft machine guns, and a Bren light machine gun for self defence. It

[243] R. Brooks, *The Royal Marines 1664 to the present*, Annapolis, 2002, p. 253
[244] Friend and Gardiner, p. 140.
[245] J. Durnford-Slater, *Commando*, London, 1955, pp. 18-19
[246] Durnford-Slater, p. 30.

could carry up to 35 men and 800 pounds of equipment.[247] But most importantly, it had a bow ramp allowing rapid and smooth discharge of men and equipment onto the shore. A report compiled by US Marine officers noted that the LCA had several advantages over the rampless and unarmoured US Higgins Eureka craft the US Marine's then standard landing craft.[248] Conversely, an earlier British supply mission to the United States noted that the 18kt speed of the Higgins Eureka was greater than that of the 11kt LCA, and that this difference in speed would produce a superior raiding craft. Subsequently, the Eureka entered British service in October 1940 as the Landing Craft Personnel (Large), or LCP(L).[249]

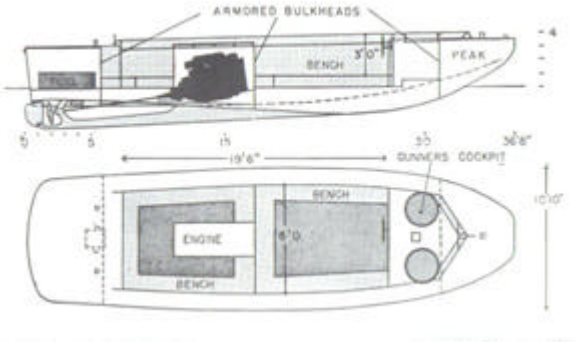


Figure 8. Drawing of Higgins Eureka boat - the LCP(L). (ONI 226)

The interwar development of the LCM by the British was the result of a desire to provide a way of landing tanks safely on the shore. This first British design became known later as the LCM(1). The first LCM(1) was able to carry either a 16 ton tank or 100 troops. It had a bow ramp, and its cargo deck was below its waterline giving greater stability. The US Navy's Bureau of Ships (BuShips)

[247] *ONI 226 Allied Landing Craft and Ships*, Washington, 1944 reprinted in A. D. Baker, *Allied Landing Craft of World War Two*, London, 1985, n.p. hereafter ONI 226.
[248] HAF Box 45, Folder 807, S.B. Griffith, and W. M. Greene, *Report on Combined Operations Training Centre, Inverary, Argyllshire, Scotland 7-19 December 1941*, n.p. , 1942, p. 5.
[249] Friend and Gardiner, p. 143.

investigated the craft for its own purposes but decided against adopting it, preferring to pursue development of its own design for a tank landing craft.[250] Higgins Industries in the United States had produced a similar craft. This craft had superior performance to the BuShips design, and the British became interested in it as it could be used to augment the numbers of LCM(1) currently in British service. Higgins' craft impressed the British, as did his confidence in being able to produce the craft quickly. Higgins' craft later became designated the LCM(2), and was adopted into both United States and British service. As the war progressed it became apparent that the increasing size of tanks entering service would require larger landing craft, this would lead to the production of the LCM(3) by Higgins Industries and its widespread adoption by the Allies.

Photo 3. Photo of LCM 2 (ONI 226)

As new landing craft had been developed it became necessary to develop a new class of ship to transport them to the area of operations. The requirement for such a ship was not issued until April 1940, when it was recognised that conducting amphibious

[250] N. Friedman, *U.S. Amphibious Ships and Craft: An Illustrated Design History,* Annapolis, 2002, p. 91.

operations might prove necessary. The resulting Landing Ships Infantry (LSI) were converted from merchant ships. As the war progressed they were provided with increasingly better and more powerful davits allowing additional and heavier landing craft to be carried.[251]

In the aftermath of the British evacuation from Dunkirk in 1940, Winston Churchill ordered the development of a landing craft capable of carrying a 40 ton tank, larger than any tank currently in British service. This was a result of Admiralty assessments of the requirements of any future invasion of Europe.[252] Until Britain was in a position to mount the liberation of occupied Europe, British military planners decided to utilise a traditional British strategy against dominant continental powers of conducting raiding operations and mounting campaigns on the enemy's peripheral territories.[253] While this strategy gained the British experience in conducting amphibious operations, it became apparent that the delays caused by a parent ship recovering smaller landing craft posed unacceptable risks to planning hit and run raiding operations. Ideally, a craft was required that could carry a large raiding force, beach, discharge the force, recover them, and then unbeach itself. Additionally, after the failure of the unsuccessful 1940 expedition to Dakar, Churchill ordered the development of a ship capable of transporting tanks anywhere in the world and discharging them directly onto shore.[254] These three design concepts were to result

[251] Friend and Gardiner, p. 143.
[252] Friend and Gardiner, p. 143.
[253] H. Richmond, *British Strategy Military & Economic: A Historical Review and its Contemporary Lessons*, London, 1941, p. viii.
[254] Friend and Gardiner, p. 144.

respectively in the Landing Craft Infantry or LCI, the Landing Craft Tank or LCT, and the Landing Ship Tank or LST.

These three new designs were produced in the United Kingdom, and proved satisfactory. However, Admiralty projections for the future invasion of Europe, and the projected operational requirements of the Mediterranean theatre, necessitated the production of these vessels in greater numbers than could then be currently produced in Britain.

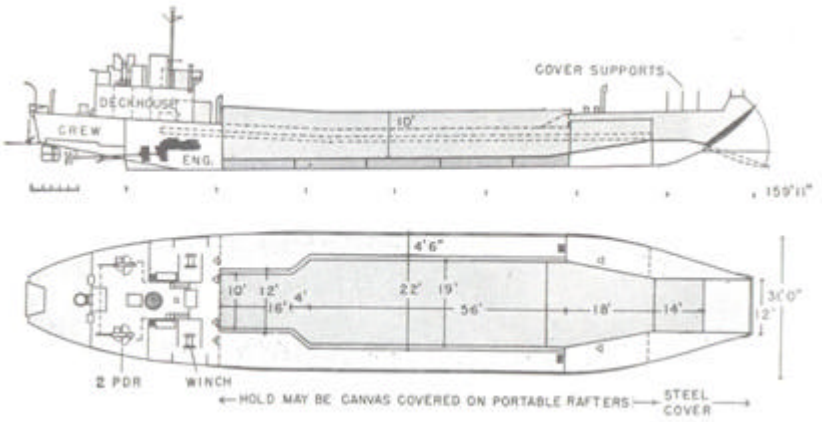


Figure 9. Picture of LCT 1 (ONI 226)

As British shipbuilding was becoming stretched by the demands of the Battle of the Atlantic, these new vessels could only be produced in the United States. In addition, due to shipping constraints the new vessels would have to be capable of crossing the Atlantic Ocean under their own power. The final restriction was that in order for these vessels to be produced under Lend-Lease provisions, the new designs would have to be adopted into service by a branch of the US military.[255] As the idea of larger vessels capable of beaching and discharging their cargo directly on to the shore fitted the US Army's approach to amphibious operations, and the design of the

[255] Friend and Gardiner, p. 144-145.

LCT suited US Navy and Marine ideas, the process of adoption proved to have few hurdles.

For US production facilities to be used under Lend-Lease conditions, a design had to be accepted into service by the US military. For this to occur, a design had to meet criteria specified by one of the branches of the US military. A series of joint ventures resulted, wherein British staff requirements produced design concepts that were then altered to suit both parties before being manufactured in the United States. This also resulted in a partial standardisation of types between US and UK forces, and a uniformity of nomenclature for Allied amphibious equipment.[256] This nomenclature would later be expanded to include the craft produced by Australia for its own use.

Thus LCTs manufactured in Britain by the British became types LCT(1), LCT(2), LCT(3), LCT(4), LCT(8), and LCT(9), while the United States produced versions became LCT(5) and LCT(6). Similarly, the British made LSI became the LSI(S), with the more numerous US version becoming the LSI(L). The various marks of LSTs produced in the United Kingdom were LST, LST(1), LST(3), and LST(4), with the United States model becoming the LST(2).

Once the basic designs of landing craft and ships had been developed, variants soon appeared to meet requirements for specialist roles. Many of these roles were to provide additional fire support for the landing in either a direct or general fire role, or to provide anti aircraft fire. Other roles included the provision of repair facilities, mine clearing, supply of fuel and water, and the provision of command, control and communication facilities.

[256] Friend and Gardiner, p. 147.

The development of specialised armoured combat engineering vehicles was a direct development of experience with had been gained at Dieppe, the Torch landings in North Africa, and the invasion of Sicily. The knowledge gained during those operations had shown that in order to quickly exit the beach and expand the beachhead into the surrounding territory, it would be necessary to overcome not just enemy strongpoints and beach defences but the terrain of the landing site itself.[257] As a result a variety of equipments were tested in preparation for use in the planned invasion of Europe. These vehicles were designed to provide the landing force with the combat engineering facilities needed to overcome a variety of obstacles such as bunkers, minefields, ditches, and soft or loose terrain. Employed at Normandy as the British 79th Armoured Division they proved remarkably successful in that role.

The British also developed a means of providing an inflatable canvas screen for use as a floatation device by tanks. Previous methods experimented with were limited in the size of the tank they could use. By using this device it was hoped to augment the number of tanks arriving on the landing beaches, above those that could be carried by available landing craft. The resultant Duplex Drive system allowed a tank to be launched from a LCT at sea and proceed towards shore under its own power where the canvas screen could be easily collapsed and the tank used as normal.[258] While the initial tests had used British Valentine tanks, the final production model used the M4 Sherman tank.[259]

[257] T. Hall, *D-Day Operation Overlord*, London, 1993, p. 35
[258] Fletcher, p. 24.
[259] Fletcher, p. 14.

Japanese Development

Japan started the Pacific War with an amphibious force that had both excellent purpose designed equipment, a sound doctrine for landing operations, and combat experience gained during the conflict with China.

The equipment used by Japan at the beginning of the war benefited from the experience gained from amphibious exercises conducted during the 1920s and 1930s. This knowledge was further refined by lessons learnt in combat operations in China. Despite having developed and produced a range of ships and craft before the Pacific War, which performed extremely well during Japan's initial offensives, neither the Japanese Army, nor Navy, neglected further development.

However, the Japanese Navy and Army had different approaches to amphibious operations. The Navy's view was that its amphibious forces should be light and capable of rapid deployment as a rapid reaction force or for spearheading larger amphibious operations. As such SLNP formations were organised in a manner designed to enable quick transport by destroyers and other fast ships, and were equipped with a variety of automatic weapons including submachine guns – particularly in parachute units.[260] German successes with its airborne forces in Europe had inspired the creation of similar units in Japan. The German success in Norway in particular had shown that paratrooper units could be used to vertically envelop enemy forces during amphibious operations. This usage of paratroop forces fitted in well with the Navy's view of its usage of its existing ground forces. While both the Japanese Army and the opposing Allies developed airborne forces, only the

[260] J. Weeks, *Infantry Weapons*, London, 1972, p. 69.

Japanese Navy did so with the specialised mission of creating a vertical flank to amphibious operations.

The Army had the responsibility of conducting major amphibious operations, and as such produced a variety of ships and craft to fulfil this role. These included craft to provide fire support for the landing, as well as ships to transport the landing force to the area of operations. As a result of extensive experimentation conducted during amphibious exercises in the 1920s, the Japanese Army had been able to develop a bow ramped craft capable of unloading directly onto shore. This craft, the type 'A' Daihatsu landing craft entered service in 1930 and was superior to any craft then currently in service with either the United Kingdom or the United States. The Daihatsu did not replace the earlier Shohatsu landing craft in service, despite this smaller craft lacking both the ramp and carrying capacity of the Daihatsu, as the Daihatsu was to be a vehicle carrying craft and the Shohatsu was to carry personnel. Both craft were successful designs and performed well under combat conditions in China and the Pacific War.[261] Variants of these craft included both wooden versions as steel was diverted to other purposes, and the mounting of additional weapons to create support craft capable of conducting raiding operations and providing fire support to landing operations.[262]

In 1935 the Japanese Army commissioned the *Shishu Maru* as a purpose designed landing craft carrier. This ship was able to launch 20 Daihatsu craft via its stern doors, whilst simultaneously loading other craft through ports in its sides.[263] When used in operations at

[261] http://www3.plala.or.jp/taki.home/shohatsu.html
[262] A. J. Barker, *Japanese Army Handbook 1939-1945*, London, 1979, p. 106.
[263] R. Chesneau, *Conway's All The World's Fighting Ships 1922-1946*, London, 1980, p. 214.

Shanghai in 1937, this ship generated a great deal of attention from the US Marines and US Navy officers present, and featured in reports sent back to the United States.[264]

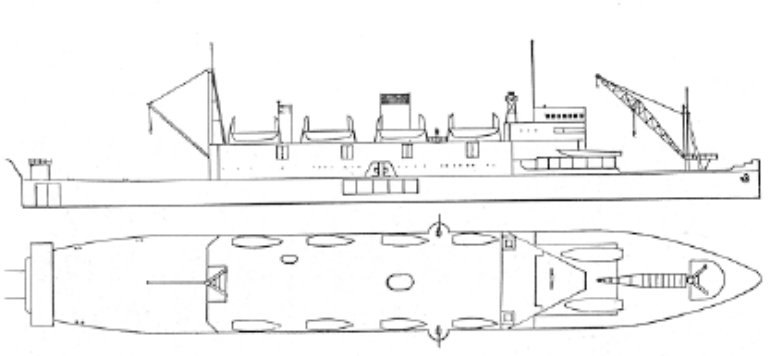


Figure 10. drawing of Shishu Maru (ONI 225J)

The *Shishu Maru* was also capable of carrying aircraft as cargo, and acting as a tender for floatplanes that could be used to support amphibious operations.[265] This feature was incorporated into later designs of landing craft carriers, such as the *Akitsu Maru* class launched in 1941-42. These ships were designed with a flat top similar to aircraft carriers, and were used to transport aircraft and supplies to outlying outposts. Plans were made to extend the flight deck of the *Akitsu Maru* in order to allow the recovery of aircraft, but the war ended before this could be enacted.[266]

With the entry into service of the new type 97 'Chi-Ha' medium tank in 1937, the Japanese Army started work on the creation of a landing craft capable of transporting it. The successful Daihatsu was used as a basis for the new craft, which was essentially an enlarged Daihatsu landing craft. The new Toku-Daihatsu, or

[264] Reports such as HAF Box 4, Folder 127, M.G. Brown, *Japanese Special Landing Force Boats and Boat Ships*, n.p, 1939 and HAF Box 2, Folder 127, V.H. Krulak, *Report on Japanese Assault Landing Operations Shanghai Area 1937*, Shanghai, 1938.
[265] ONI 225 J, p. 21.
[266] Chesneau, p. 213.

Special Daihatsu, entered service in 1940 and was able to carry 120 troops or a single type 97 tank.[267]

The Japanese continued the process of design and development of amphibious equipment throughout the war. This process continued even after the Japanese military had lost the strategic initiative and the ability to conduct large scale offensive landings as a result of the aircraft carrier losses at the Battle of Midway, and the piercing of the outer defence screen with seizure of Tarawa Atoll by US forces in 1943.

Despite the loss of the strategic initiative the Japanese still had valid reasons for continuing to develop their amphibious forces. The Japanese military had to consider the employment of amphibious equipment for other tasks such as the transport of troops and supplies between outposts with little infrastructure.[268] Furthermore amphibian vehicles were used to defend against Allied landings, and were required as part the doctrinal requirement of conducting an amphibious counterstroke against any successful Allied landing.[269] While no such counter landings were ever conducted, the production of equipment usable in such a role continued throughout the war.

Thus the intended purpose for many items of Japanese equipment is often unclear. An example is the Japanese Navy's upgrading of the Chi-Ha medium tank's armament from a 57mm gun to a 120mm gun.[270] Very small numbers of this variant were produced late in the war, but whether its purpose was to act as a specialised combat

[267] http://www3.plala.or.jp/takihome/toku-daihatsu.html
[268] Friend and Gardiner, p. 149.
[269] J. H. Alexander, *Utmost Savagery: The Three Days of Tarawa*, Annapolis, 1995, p. xvi and Friend and Gardiner, p. 149.
[270] http://www3.plala.or.jp/takihome/12cm.htm

engineering vehicle to destroy enemy strongpoints during landing operations, (as in the case of the 95mm close support howitzer armed Centaurs of the Royal Marines on D-Day at Normandy),[271] or to act as a general heavy fire support vehicle for conventional armoured formations in the Japanese Navy's ground forces, (as in the manner of 105mm armed Sherman tanks in the US Army),[272] is unknown. Either option is equally plausible, but due to the scarcity of sources in both Japanese and English it is impossible to be certain.

The necessity of supplying outposts with limited port facilities resulted in the development of the Japanese Yusokan Class. These vessels had to be able to land their charge directly onto shore, have sufficient endurance and speed to complete their journey between islands under cover of darkness, and look unimportant enough as to avoid aerial attack should they be seen by Allied aircraft during the day.[273] Superficially the resulting Yusokan Class looked much like the Allied LCT, but unlike the LCT it was used only for providing logistical support between friendly shores.

Despite having conducted its first tests with amphibian tanks in 1926, and the purchase of British commercial models in 1932, Japan did not have an amphibian tank enter service until 1942 with the introduction by the Japanese Navy of the lightly armed and armoured Type 2 Amphibious Tank 'Ka-Mi'.[274] This tank, based on the Type 95 light tank, was equipped with detachable flotation units similar to British tanks purchased by Japan in the 1930s.

[271] Anon., "RMASC Centaur", *After The Battle*, No. 18, 1977, p. 50.
[272] C. F. Foss, *World War II Tanks and Fighting Vehicles*, London, 1981, p. 132.
[273] R. Merriam, *Japanese Landing Craft of World War II: U.S. Naval Technical Mission to Japan*, Bannington, 2006, pp. 14-15.
[274] http://www3.plala.or.jp/takihome/ka-mi.htm

Further developments resulted in the Type 3 Amphibious Tank 'Ka-Chi' in 1943. This was the heaviest and most powerful amphibian tank to enter service with the Japanese Navy, and was armed with a 47mm gun.[275] Improved amphibious performance was gained by incorporating the flotation units as part of the hull. Like the earlier 'Ka-Mi', the 'Kai-Chi' was designed to be transportable on the deck of a submarine, a feature shared by other Japanese amphibian craft, such as the Katsusha.[276] This vehicle was able to carry 40 troops and was armed with two torpedoes[277]. The vehicle would thus be useful for both conducting amphibious raids and operations against enemy landing forces. However, no record exists of it being used in either role.

Name	Production
Amphibian truck Suki	198
Type 2 Amphibious Tank Ka-Mi	184
Type 3 Amphibious Tank Ka-Chi	19

Table 2. Total Japanese Amphibian Vehicle Production (Source Taki)

A more successful amphibian design was the Suki, an amphibian truck. Like the United States, the Japanese realised the utility of an amphibian truck, as it would allow cargoes to be taken from ships to any point on shore without the necessity of reloading the cargo onto another vehicle. The Japanese approach to the design resulted in essentially a wheeled boat, whereas the United States produced a truck that could float. The Suki was able to carry both cargo and personnel and was deployed throughout the Pacific.[278]

[275] Borg-Warner Corporation, p. 33.
[276] Bong-Warner Corporation, p. 34.
[277] http://uk.geocities.com/sadakichiD9/navy/IJN200.htm#ka-Mi
[278] http://www3.plala.or.jp/takihome/su-ki.htm

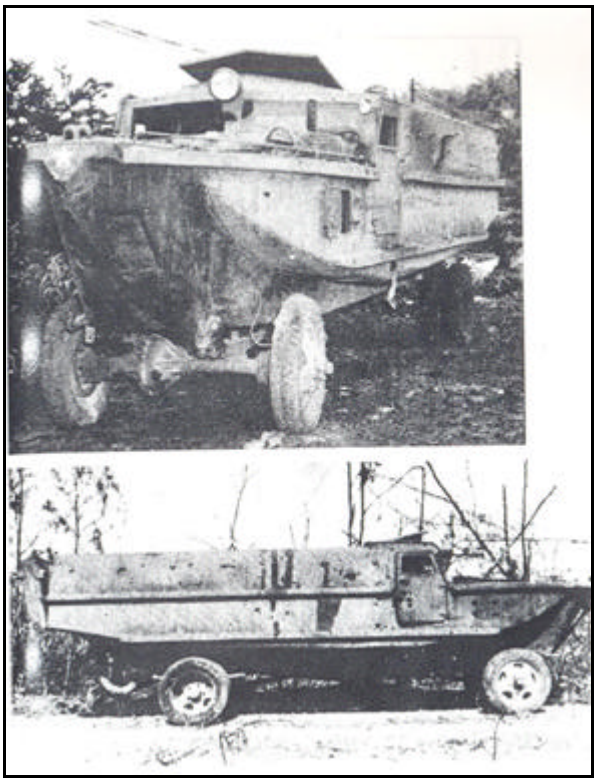


Photo 4. Japanese Amphibian Truck Su-Ki. (IWM photo)[279]

Only the major types of Japanese amphibious equipment have been mentioned here as large numbers of individual prototype models and variants were produced and played little part in the overall development of amphibious equipment, nor in the conduct of operations conducted during the war. The Japanese did develop many of the ideas behind modern amphibious ships and craft, and were the first to solve many of the technical problems in developing these vessels. The Japanese continually developed new amphibious equipment and demonstrated a keen awareness of the importance of integrating airpower into amphibious forces. This awareness is reflected in both the creation of paratroop units to spearhead amphibious operations, and the creation of landing craft carriers with integral aircraft, such as the floatplanes carried by the

[279] A. J. Barker, *Japanese Army Handbook 1939-1945*, London, 199, p. 105.

Shishu Maru. The Japanese displayed great imagination in creating innovative amphibious equipment that was studied in detail by other powers. The United States had paid keen interest in Japanese developments before the war, and after the war a US Navy technical mission extensively investigated Japan's amphibious equipment and the process of its development.[280]

United States Development

As a result of the series of FLEXs[281] conducted during the interwar period the US Marines had developed a robust and comprehensive doctrine regarding amphibious operations. This doctrine *FTP-167 Landing Operations on Hostile Shores* emphasised factors such as combat loading transports,[282] ship to shore movement, and naval gunfire support, but also stressed the importance of planning in amphibious operations in that they were more than just delivering troops onto a beach. Because of this *FTP-167* was able to not only show the best way to use existing equipment but also point the way forwards for what would be needed for the future.

By emphasising logistics as well as combat in planning amphibious operations, a number of innovations in cargo handling were developed such as forklifts and the introduction of pallets for cargo. The level of information given on them in US Marine staff planning guides shows the importance that was placed on these equipments,[283] and that one of the concerns raised in the post-

[280] Merriam, p. 4.
[281] Fleet Landing Exercises
[282] Combat loading is the process wherein equipment is loaded in a manner to maximise space in available transport, and minimise risk by spreading equipment across several transports while still doing so in a manner which allows for the rapid unloading of equipment and units according to preplanned priority. In short, equipment for combat operations is loaded last so it can be unloaded first.
[283] USMC, *Staff Officers' Field Manual for Amphibious Operations (Especially as It Pertains to the Pacific Ocean Area): Organization, Technical and Logistical data,* Washington, 1944 was a manual devoted to the subject.

action analysis of Tarawa was how well the pallets had performed under combat conditions.

Another boon to logistics was the adoption of the Dukw in 1942. Essentially an amphibian version of the standard two and a half ton US Army truck, the Dukw was able to transport supplies from ship to shore and beyond without the need for unloading and transferring the cargo to a new vehicle.[284]

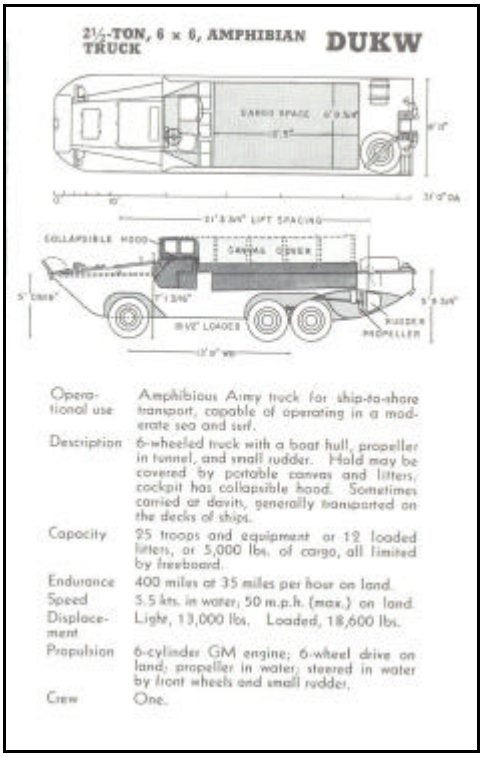


Figure 11. Information on Dukw (ONI 226)

The testing of landing craft designs during the interwar period had proved the requirement for purpose built craft. From the results of this process the US Navy had developed the specifications for these craft and passed them to BuShips. The US Army had developed its own ideas about the future conduct of amphibious operations, and rather than the multiple small craft envisioned by

[284] *FMFRP 12-90 Second Marine Division Report on Gilbert Islands Tarawa Operation*, n.p., 1943, p. 2.

the US Navy and Marines, they preferred the concept of less craft capable of greater endurance and carrying more.

As a result of this thinking in the US Army, the British concepts of the LCI and the LST were adopted into service with the United States. As such both designs could be produced under Lend–Lease conditions. While it was originally intended for these craft to be used in assault and raiding roles, their usual employment was to discharge troops and cargo directly onto shore as part of the consolidation of a landing. In addition the ability of the LST to beach itself made it extremely useful in the Pacific where port facilities were often rudimentary.

During the process of trials and testing before the procurement of the Higgins Eureka boat, many US Marine Officers noted that the designs produced by BuShips were inferior to those produced by other parties, in particular those produced by Higgins Industries[285]. At the same time reports were being received on landing craft used by the Japanese, as well as those in British service. Both the British and Japanese had introduced into service an armoured bow ramped landing craft prior to 1940. The Eureka was accepted into United States service in 1940, having proven itself superior to the BuShips design.[286]

The Higgins design was unarmoured and fast with excellent seakeeping characteristics with a hard chin allowing it to beach even on stony shores. It was able to carry 25 to 36 troops, and after July 1942 was known as the Landing Craft Personnel or LCP.

[285] Friedman, p. 80.
[286] Friedman p. 82.

While information on the successful use of ramped landing craft by the Japanese had been known since 1937, this feature was not viewed as being a critical design factor compared to either speed or sea-keeping. Contemporary designs by US Marine Officer Victor Krulak, source of many photos of ramped Japanese landing craft, show that the postwar importance he placed on ramps were not necessarily reflected in his contemporary designs.[287]

Experience gained in conducting amphibious operations soon showed the utility of bow ramped craft. As a result Higgins was approached in 1941 to install a bow ramp on his Eureka boat, and was shown a picture of a bow ramped Japanese craft by a U.S. Marine Officer.[288] Higgins installed the ramp and the resulting design became the Landing Craft Personnel, Ramped or LCP(R). A similar craft was also designed for light vehicles, being the Landing Craft, Vehicle or LCV. As both of these craft were extremely similar in size, shape, and performance it was decided to standardise both into one design, the Landing Craft Vehicle Personnel (LCVP). The LCVP was able to carry 36 men or a 6000 lb vehicle or 8,100 lb general cargo and became the standard landing craft for this role in Allied operations.[289] While LCPs, LCP(R)s, and LCAs were still used for operations this was as a result of landing craft production not being able to keep up with the demands of multiple theatres.[290]

[287] Krulak's claims are mentioned in J. E. Strahan, *Andrew Jackson Higgins and the Boats that Won World War II,* Baton Rouge, 1994 p. 57, and are interesting when contrasted to his own designs in V. H. Krulak, *The Design and Procurement of Suitable Landing Boats*, n.p., 1939, which contain designs for both ramped and non ramped craft.
[288] *ONI 226* n.p.
[289] S. Zaloga, *Amtracs: US Amphibious Assault Vehicles*, London, 1987.
[290] See the entry for LCVPs in *ONI 226.*

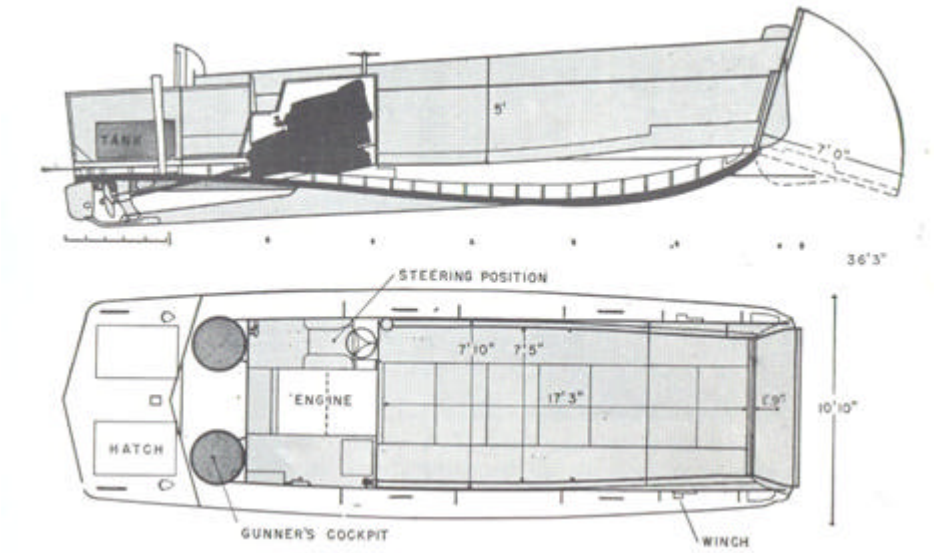


Figure 12. Drawing of LCVP (ONI 226)

Higgins also produced a tank lighter[291] that proved superior to the BuShips design. This craft the LCM(2) was produced as result of a December 1941 request to Higgins Industries to produce a landing craft capable of carrying a light tank. Higgins produced the prototype in 60 hours. It was capable of carrying a 16 ton tank and had a bow ramp.[292] This craft would lead to the development of the LCM(3) which became the standard Allied craft for landing a single tank.

This standardisation was a result of the increasing co-operation between British and United States designers. The impact of British ideas on the design of amphibious equipment, coupled with United States ideas about the conduct of amphibious warfare, resulted in the development of several new classes of amphibious vessels. Designers in the United States viewed British naval constructor Rowland Baker with a great deal of respect. His ideas contributed greatly to the development of the Landing Ship Dock, or LSD, a

[291] A lighter is a type of small craft designed to carry cargo ashore.
[292] A. Adcock, *WWII US Landing Craft* , Carrollton, n.d. , p. 15.

ship that was able to launch loaded landing craft by flooding its stern and releasing the craft out the back. The advantage to this technique was that craft could be launched while the ship was still moving giving greater protection to the ship and speeding the launch of the landing force. The technique was used with success at Tarawa in 1943 with LCMs carrying tanks. British influence was seen in the design of a class of dedicated headquarter ships for amphibious operations. Events during Operation Torch and later at Tarawa would prove the value of such ships.

The US Marines were well aware that coral reefs surrounding atolls in the Pacific could pose problems for landing craft and had desired an amphibian tractor capable of crossing reefs. With the introduction into service in 1941 of the Landing Vehicle Tracked or LVT, the US Marines had gained a vehicle capable of fulfilling this role. Based on the Roebling tractor the LVT was originally designed to be used for logistics purposes. Testing was conducted in Fiji to see if armoured LVTs were capable of a reef crossing. Because the testing was successful it was used as an assault transport for the first time at Tarawa, along with the improved LVT2. The success of the LVT resulted in an increase in the machine guns carried and the development of armoured support vehicles based on its hull. The LVT(A)-4 had an open turret mounting a 75mm howitzer, while the LVT(A)-1 had an enclosed top and mounted a 37mm gun in its turret. These were able to provide direct fire support to the landing force, and could function as tanks once on land.

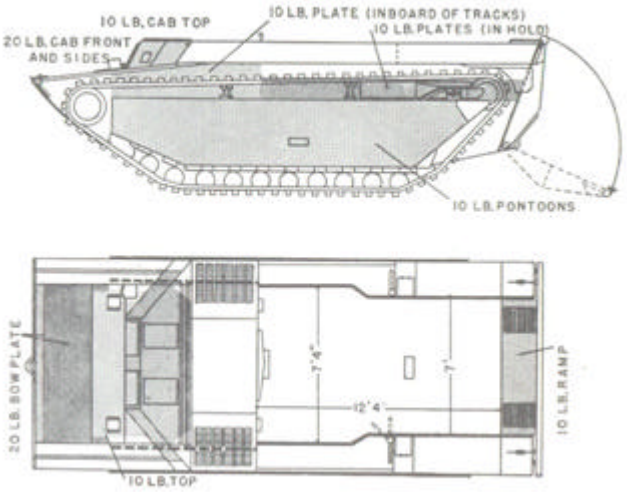


Figure 7.

Picture of LVT 4 (ONI 226)

The desire to increase firepower in US Marine units led to the unofficial usage of machine guns from crashed aircraft by Marines. These guns were adapted for infantry usage and were known as stingers.[293] As the war progressed the Marine divisions received more automatic weapons and gained heavier tanks. Marine units also received greater numbers of flamethrowers and flame tanks that were used to neutralise bunkers in beach defences. This added to the shock value of each division, essential since the small size of islands in the Pacific generally precluded any form of surprise as to where a landing would occur.

The development of modern equipment

The postwar landing craft in use today bear lineal descent from the ramped landing craft designed by Higgins, a craft that was directly influenced by the Japanese invention of the bow ramped landing craft. This process of development is not limited to just landing craft, for modern amphibious warfare vessels such as the US

[293] G. Rottman, *US Marine Corps 1941-45*, Botley, 2004, p. 8.

Navy's *Iwo Jima* class are also the synthesis of design concepts that evolved as a result of the Pacific War. The Japanese desire to integrate airpower with amphibious operations saw the creation of landing craft carriers capable of carrying aircraft. The idea of having organic airpower in an amphibious taskforce had also occurred to the Americans who dispatched carrier forces as part of all Pacific amphibious operations. The concept would finally find fruit in the postwar development of modern US Navy ships such as the *Wasp* class, that combine the features of both escort carriers and LSDs.

Photo 5. US Navy Wasp Class Amphibious Assault ship (US Navy Photo)

The layout of these ships is very similar to that of Japanese landing craft carriers of the *Akitsu Maru* class,[294] which like all Japanese ships were studied postwar by the US Navy's technical mission. Likewise the current generation of amphibious armoured fighting vehicles in use today owe much to the work of the USMC who not only pioneered the creation of a fully tracked amphibious vehicle, but also its applications in amphibious operations. The creation of

[294] For technical data see R. Gardiner (editor), *Conway's All The World's Fighting Ships 1922-1946*, London, 1980, p. 213.

these key types of equipment owes much to both interwar development and operational experience during the war.

Photo 6. Akitsu Maru Class Landing Craft Carrier (US Navy Photo)

Chapter Five Amphibious Operations during the Pacific War

The outbreak of hostilities in Europe during 1939 had at first very little direct effect on conditions in the Pacific. This was despite the majority of the area being colonial possessions of, or otherwise affiliated to, European states that were to suffer major reverses during the early part of World War Two.

Initially these effects were limited to the uptake of merchant shipping for military purposes by respective governments, and the imposition of rationing on territories controlled by combatant powers. This gap in shipping though was partly filled by neutral carriers. The war in Europe also caused supplies of manufactured goods to be reduced. German commerce raiders also caused disruption to sea lanes of communication, most notably with mine laying activities and the shelling of the phosphate mines at Nauru.[295]

The rapid German successes in Europe during 1940 resulted in the creation of a strategic environment favourable to Japanese interests. The invasion and occupation of their homelands left French and Dutch colonies bereft of any support from Europe. The British continuation of the war against Germany left its dominions and colonies in a similar, but less precarious situation. As a result Japan was able to make increasingly larger demands on these territories to supply raw materials. These raw materials were needed to supply the demands of both the Japanese domestic economy and the demands of the war in China. Japan was also

[295] RN Naval Intelligence Division, *B.R. 519 Geographical Handbook Series: Pacific Islands Vol. II Eastern Pacific*, London, 1943, p. 693.

able to secure basing rights in French Indochina, and obtain the cessation of road and rail communications to China.

Traditionally, Japan had looked towards China and the Russian Far East as a source of resources and living space for its increasing population. This northward policy of expansion had resulted in some successes, such as the acquisition of Manchuria. However, it had also resulted in unsuccessful military confrontations with the USSR, a war in China that appeared to have no quick conclusion in sight, and had resulted in trade sanctions on vital imports and the exports required to pay for them. With this in mind, the Japanese decided to 'go south' to seize resources by force, thus beginning the Pacific war.

In order to achieve the conquest of these territories, and conduct a knockout blow against the United States, Japan had to conduct a series of rapid virtually simultaneous operations against targets spread throughout the Pacific. Naturally these involved amphibious operations. These operations ranged from small parties informing locals of a change of ownership, through to large scale assaults. The goal of these operations was not just to seize resources, but neutralise enemy forces, and obtain territories suitable as air and naval bases to act as a defensive perimeter for their new empire.

The Pacific war presented geographical challenges quite unlike those encountered during the campaign against Germany. Unlike the European theatre, planners in the Pacific were often confronted with having to plan operations in areas that were not fully mapped. The general paucity of accurate information available is demonstrated aptly by the misidentification of the Tenaru River on Guadalcanal, a mistake not rectified until after the war, despite

being the site of a pivotal battle.[296] In addition, meteorological and hydrological data was often lacking, and in some areas only anecdotal in nature.[297] Lines of communication[298] in the Pacific were both long and easily disrupted by enemy activity or local weather conditions. In addition, these lines of communication were often underdeveloped, with many locations in the Pacific lacking even basic infrastructure. Air communications across the Pacific were still in their infancy, with many new routes only being opened just before the outbreak of hostilities.[299] Cable and wireless communications were also prone to disruption, either by seismic activity breaking cables,[300] or by atmospheric conditions disrupting signals. Limited numbers of wireless stations capable of relaying a signal meant that minimal redundancy in the broadcasting network existed in transmitting a signal should such a problem occur. Further complications to signal communications developed for the Allies with the seizure of American cable facilities on Guam early in the war. Sea communications had to be conducted over long distances, often to destinations with either limited or non-existent port facilities. This infrastructure had to be developed as the war progressed, not just to support offensive operations, but in order to merely maintain the forces required to defend Allied territory.

Amphibious operations conducted by the Western Allies against German forces in Europe had the advantage of being conducted in

---

[296] F. O. Hough, V. E. Ludwig, and H. I. Shaw, *Pearl Harbor To Guadalcanal: History of U.S. Marine Corps Operations in World War II Vol. I,* Washington, n.d. p. 256.
[297] The classic example is the neap tide controversy at Tarawa. Only one man of the numerous ex-residents was able to warn of the possibility of a dodging tide on the invasion date.
[298] Sea lanes, Air lanes, and Signal communications.
[299] For an indepth look at the development of prewar air routes see K., Williams, *Army Air Forces Historical Studies No. 45: Development of the South Pacific Air Route,* n.p., 1946.
[300] RN Naval Intelligence Division, *B.R. 519 Geographical Handbook Series: Pacific Islands Vol. I General Survey*, London, 1945, p. 39.

areas where meteorological, hydrological, and topographical factors were all well known. Operations conducted in the European theatre also had the advantage of having shorter lines of communication and a more highly developed infrastructure. Furthermore, in the areas where operations were to be conducted it was possible to select areas of coastline that allowed the landing of craft and ships directly onto the shore. Most importantly, they all occurred in areas where land based Allied air power could be used to support amphibious operations. In the Pacific, these factors were either unknown, or presented problems that had to be solved, such as coral reefs preventing direct access to island beaches.[301] The tropical climate of the Pacific presented its own challenges to maintaining personnel and equipment. Both sides attempted to educate their forces in methods suitable for coping with the environment by soliciting advice from those who had experience of the area before the war. The means of disseminating this information to personnel ranged from the issuing of literature through to the creation of educational films on various subject matters.

The Japanese produced, and issued, 40,000 copies of the pamphlet *Read This Alone – And The War Can Be Won*, to troops embarking on amphibious operations in South East Asia.[302] This pamphlet contained much in the way of both propaganda and useful advice on campaigning in the tropics, in addition to less useful information on the medicinal value of snake liver. However, the importance of weapon and equipment maintenance in tropical conditions is emphasised, as is the need to conserve water and

[301] The most famous example of this was at Tarawa in the Gilbert Islands.
[302] M. Tsuji, *Singapore: The Japanese Version*, London, 1966, p. 29. A translation of the pamphlet can be found in Appendix 1 pp. 237-275.

petrol. In addition the righteousness of the Japanese cause is stressed throughout.

Allied attempts to combat the paucity of information available on many parts of the Pacific resulted in the reprinting of the Royal Geographical Society's *Pacific Handbook*, and the creation of a superb four volume handbook by the Royal Navy, which was completed in 1945.[303]

Impact of experience gained in other theatres

The impact of operations in other theatres had been felt even before war began in the Pacific. This resulted from the observations, and the conclusions drawn from those observations, made by the militaries of both the United States[304] and Japan[305] on events in the European war. Of keen interest to both militaries was the German employment of airborne forces. This stimulated the development of parachute forces in both Japan and the United States, and in Britain too.[306] The German success in capturing Crete, despite British dominance of the surrounding waters, clearly showed the potential of airborne forces. The large German casualties suffered in taking Crete also demonstrated the pitfalls of airborne operations, the high casualties resulting in "the end of the German airborne forces".[307]

---

[303] RN Naval Intelligence Division, *B.R. 519 Geographical Handbook Series: Pacific Islands Vol. I General Survey*, London, 1945.
RN Naval Intelligence Division, *B.R. 519 Geographical Handbook Series: Pacific Islands Vol. II Eastern Pacific*, London, 1943.
RN Naval Intelligence Division, *B.R. 519 B Geographical Handbook Series: Pacific Islands Vol. III Western Pacific (Tonga to the Solomon Islands)*, London, 1944.
RN Naval Intelligence Division, *B.R. 519 C Geographical Handbook Series: Pacific Islands Vol. IV Western Pacific (New Guinea and Islands Northward)*, London, 1945.
[304] G. Rottman and A. Takizawa, *Japanese Parachute Forces of World War II*, Oxford, 2005, p. 3.
[305] P. Harclerode, *Wings Of War: Airborne Warfare 1918-1945*, London, 2006, p. 265.
[306] Ibid, p.197.
[307] German General Kurt Student cited in Harclerode, p.107.

The advantage gained in employing airborne forces was that it allowed an attacker to vertically envelop an enemy force – in essence cutting off or encircling an enemy by threatening their rear or flanks. The Allies would use airborne forces in this role in North Africa, Sicily, and Normandy, in support of amphibious assaults.

The success gained by Germany's mechanised forces in the early campaigns in the west had a profound effect on American rearmament. As a result the United States committed itself to the creation of an army that would be reliant on the internal combustion engine. This was partially the result of a belief that the German Army consisted solely of mechanised and motorised formations,[308] and partially due to the increased permeation of automobiles through American society and industry compared to other combatant powers.[309]

British operations were also studied by the militaries of the United States and Japan. The success of the British aerial attack on the Italian fleet anchored at Taranto is thought by some to have provided inspiration to the Japanese for their attack on the American fleet at Pearl Harbor.[310] British commando raids were closely studied by the United States Marines,[311] and provided the inspiration for the formation of Marine Raider battalions. The passing of the 1941 Lend-Lease Act resulted in closer ties between

[308] A mechanised formation is one in which the combat elements are largely equipped with armoured vehicles, while a motorised formation is one which all its transport elements are all motorised.
[309] R. Overy, *Why The Allies Won*, London, 1996, pp. 224-225.
[310] G. H. Gill, *Australia In The War Of 1939-1945: Series Two Navy: Volume II Royal Australian Navy, 1942-1945*, Canberra, 1968, p. xiii.
[311] Two USMC Officers were detached to act as observers on British commando operations and equipment. Their 1942 report can be found in the USMC Historical Amphibious Files in Box 45 Folder 807.

the British and American military establishments, especially in the areas of research and development of amphibious ships and craft.[312] In order for equipment to qualify for 'lend lease' status it had to be accepted into US service.

With the United States entry into World War Two, the relationship between Britain and the United States further developed with the exchange of knowledge and experience between the two allies. In contrast to this were the squabbles between Germany and Japan over the licensing agreements for German technology.[313]

Both the United States Marines and the United States Navy transferred amphibious planning staff between theatres. The majority of these transfers were from the European theatre to the Pacific theatre. However, many of the United States Marine and United States Naval personnel who were involved in the planning of amphibious operations in Europe had been involved in the prewar amphibious exercises designed to test the new American amphibious doctrine developed for use in a future Pacific war.[314]

Studies and reports on amphibious operations conducted by the Allies were distributed between the European and Pacific theatres, especially by the United States military. This distribution of knowledge throughout the alliance allowed the smooth introduction of new equipment from the European theatre to the Pacific theatre.

---

[312] Such as the close working relationship between British Naval Constructor Rowland Baker, and US Ship Builder Andrew Higgins, outlined in D.K. Brown, "Sir Rowland Baker, RCNC", in *Warship 1995*, London, 1995, p. 145.

[313] Chapman, J. "The 'Have-Nots' Go To War: The Economic & Technical Basis of The German Alliance with Japan", in *International Studies 1984/III The Tripartite Pact Of 1940: Japan, Germany And Italy*, p. 52.

[314] While limited in number, these officers did move between theatres and helped facilitate the flow of amphibious information. For more details see H. W. Edwards, *A Different War: Marines in Europe and North Africa*, Washington, 1994.

The majority of new items of equipment were to receive their first operational usage in the European theatre before being issued in the Pacific. This was as a result of the priority that the war against Germany had been given, and also as a result of the arms race in weapons development caused by the need to maintain parity with new German weapon designs. As a consequence of this arms race between the Allies and Germany, Allied forces in the Pacific would eventually gain a qualitative advantage over much of the equipment of their Japanese counterparts. The result was increased firepower for Allied ground forces, especially in armoured vehicles, artillery, and infantry weapons.

The lack of even basic port infrastructure in many parts of the Pacific necessitated the utilisation of ships and craft able to discharge their cargoes directly on shore. As a result the majority of American amphibious ship production was sent to the Pacific theatre.[315] In addition, after every amphibious operation in the European theatre, ships were sent to the Pacific.[316] This resulted in a build-up of amphibious assets in the Pacific, which rather than just being newly commissioned ships, also had a leavening of experienced personnel. In some senior British circles it was felt that this accumulation of amphibious assets in the Pacific represented an American deviation from a commitment to the 'Germany First' policy.[317] However the sheer size of the Pacific theatre and its dependence on sea communications meant that large numbers of ships were required just to supply forces.

[315] Author's study of ship records in USN *Dictionary of US fighting ships*, an online resource of the USN Historical Centre at http://www.history.navy.mil
[316] Ibid.
[317] Bryant, p. 652-53.

Although some American planners would question British estimates of the number of landing craft required for operations in Europe, despite these figures being the result of a joint planning session,[318] it was hardly out of a desire to shortchange European operations as put forward by Arthur Bryant in *The Turn Of The Tide* based on CIGS Allanbrooke's diary.[319] Morison refutes this in his works, which demonstrate that the European theatre was well provided with landing craft.[320] It was to be a common complaint amongst amphibious planners in all theatres that they never had enough landing craft available.[321]

Theatre	**Type**					
	LST	LCI(L)	LCT	LCM	LCVP	LCA
U.S. in 12th Fleet (U.Kingdom)	168	124	247	216	1089	0
British in United Kingdom	61	121	664	265	0	646
U.S. in Mediterranean	23	59	44	185	395	0
British in Mediterranean	2	32	64	95	0	138
U.S. on East Coast, U.S.A	95	89	58	57	341	0
U.S. on West Coast, U.S.A	0	41	1	60	181	0
U.S. in All Pacific Areas	102	128	140	1198	2298	0
British on e. Indies Station	0	4	2	67	0	46

Table 3. Allied Landing Craft serviceable and operational in all theatres 1 June 1944.[322]

The United States' commitment towards the policy of 'Germany First' is demonstrated in part by its deployment of its ground forces. In March 1945, out of a total "eighty-nine Army combat ready divisions, sixty-eight were now in the European-Mediterranean area and twenty-one in the Pacific; all six Marine divisions were in the

[318] Bryant, p. 656.
[319] Bryant, p. 620, p. 629.
[320] Morison, S. E., *American Contributions to the strategy of World War II*, London, 1958, p. 50.
[321] Ibid, p. 49.
[322] Ibid, p. 50.

Pacific".[323] This allocation of forces shows that even as the war in Europe was drawing to a close, Germany remained the priority.

The Allies waged a global war, while the Axis powers each conducted their own separate wars with little attempt at coordination.[324] What little coordination existed was the result of the Axis being faced with common enemies, rather than sharing common goals. Unlike the Allies, the Axis were faced with having no direct air or sea lines of communication. This added to the difficulties of providing any real material assistance to each other. While technical missions from each nation visited the other, resulting in some exchange of technology, these exchanges were never on the scale of those between the United States and Britain.

Logistical demands of global war

Simply put the United States and Britain were engaged in planning, supplying, and fighting a global war. As a result all theatres experienced shortages of amphibious equipment as operations were carefully planned according to the dictates of the grand strategy developed at conferences such as Casablanca in 1943. The resulting operations had to be able to optimise available shipping, and occur according to an agreed timetable. Operation Galvanic gives an excellent example of this: despite key equipment such as the Appalachian class of amphibious flagships not being available due to delays in production,[325] the operation had to

[323] B. A. Allen, and N. Polmar, *Codename Downfall: The Secret Plan to Invade Japan*, London, 1996, p. 148.
[324] L. Barber, and K. Henshall, *The Last War of Empires: Japan and the Pacific War*, Auckland, 1999, p. 191.
[325] G. C. Dyer, *FMFRP 12-109-II The Amphibians Came To Conquer Vol. II*, Washington, 1991, p. 611.

proceed as planned due to the requirement of the shipping involved being needed elsewhere.[326]

The combination of the United States Lend-Lease law and its vast production capacities gave the Allies the means to supply their forces with the large numbers of ships, planes, tanks, trucks, and other materiel required to wage war against the Axis powers. The United States' production capabilities allowed it to not only supply its own forces but to provide significant amounts of equipment to its allies. By 1944, the United States alone would comprise 40% of global weapon production.[327]

However, men and materiel are meaningless if they cannot be deployed to where they are required and sustained in their continued operation. 'Logistics' is the term used to describe the system of supplying military forces with the goods and services required for their continued employment. This process was complicated during the Pacific War by four major factors – geographical, limited local infrastructure, lack of local resources, and the sheer size of the forces involved.

The Pacific is the world's largest ocean, being over 166 million square kilometres in area.[328] In order for personnel, equipment, and supplies to reach the front lines, enormous distances had to be traversed. Control of the vast sea lanes of communication was a necessity for supplying forces in the Pacific, as was the shipping to carry the supplies. Due to the distances involved it took more

[326] J. H. Alexander, *The Three Days of Tarawa: Utmost Savagery*, Annapolis, 1995, p. 77.
[327] J. Keegan, *The Second World War*, London, 1989, p. 219.
[328] *The Times World Atlas*, London, 2005, p. 33.

shipping to move forces in the Pacific theatre than a similar sized force in the European theatre.[329]

Infrastructure in the Pacific during the Pacific War was in many locations either rudimentary or non-existent. In some islands, such as at Ocean Island,[330] due to the lack of port facilities visiting ships were forced to use small boats in order to discharge cargo. Even in New Zealand with its more extensive port facilities, labour disputes created problems due to the volume and nature of the cargo involved. Many United States Marines remember the spoilage of cardboard packed goods left exposed to the weather as a result of industrial action by watersiders in Wellington during the preparation for Operation Watchtower.[331]

Both sides had to create infrastructure in areas that had none, particularly in regard to air bases. The development of pierced steel matting by the Americans allowed airfields to be created quickly, but it still had to be transported to the location. Fuel, food, munitions, and often water, had to be supplied to forces requiring extensive supply lines. The development and usage of amphibian vehicles helped solve some ship to shore problems, but the lack of port facilities necessitated the creation of a range of specialised landing craft and barges which could act as wharves, quays, and aid in cargo handling even during an amphibious operation.[332]

---

[329] A. W. Gray, "Joint Logistics in the Pacific Theatre", in *The Big 'L': American Logistics in World War II*, Washington, 1997, pp. 329-330.
[330] RN Naval Intelligence Division, *B.R. 519 B Geographical Handbook Series: Pacific Islands Vol. III Western Pacific (Tonga to the Solomon Islands)*, London, 1944, p.359.
[331] R. B. Frank, *Guadalcanal: The Definitive Account of the Landmark Battle*, New York, 1992, p.52.
[332] For descriptions and data on these equipments see *Staff Officers' Field Manual for Amphibious Operations (Especially as it Pertains to the Pacific Ocean Area): Organization, Technical and Logistical Data*, Washington, 1944.

The widespread introduction of palletization by American forces during the Pacific War helped to simplify cargo handling. First introduced by railroad companies in the nineteenth century for general cargo, the savings in both time and labour were dramatic. Three days were required to unload a railway boxcar containing 13,000 cases of unpalletized canned goods. By using pallets the task took four hours.[333] In addition, warehouse space could be saved as palletized goods could be stacked on each other, or on racking, by using forklifts.

Mechanized equipment items used by Allied forces in amphibious operations were also provided with extensive waterproofing kits, in addition to their lubrication and fuel needs, thus adding to the demands on Allied logistic trains. While Japanese forces lacked the degree of mechanisation of Allied forces, the usage of animal transport caused its own special problems. Horses are difficult to transport and unload from ships.[334]

The Japanese also had problems with logistics in the Pacific. Like the Allies they used landing craft and amphibian vehicles to aid ship to shore movement. As the war progressed the Japanese faced the loss of sea and aerial lines of communication due to losses in merchant shipping and the Allied strategy of bypassing and isolating Japanese outposts leaving them to 'wither on the vine'. This resulted in solutions such as the usage of cargo submarines by the Japanese army to supply outposts,[335] and the creation of large gardens, such as at Rabaul, to feed the garrison.

---

[333] R. LeBlanc, *Pallet Evolved Along with Forklift*, article from www.palletenterprise.com

[334] The Japanese pamphlet *Read This and the War is Won* gives elaborate notes on care of horses during voyages.

[335] http;//www3.plala.or.jp/takihome

Japanese operations

In theory the Japanese military began the Pacific War with a well developed and tested amphibious doctrine. As a result of the war in China, the Japanese had conducted no less than sixteen major amphibious landings between August 1937 and March 1941.[336] These landings had provided the Japanese military the opportunity to gain valuable experience in many of the technical aspects of amphibious warfare, but had all been conducted in the face of minimal, or even non-existent, opposition. Furthermore in all of these operations the Japanese had uncontested command of the sea and airspace where the operations took place. Before the Japanese had attempted to land any military forces on the Chinese coast, they had first secured control of China's coastal waters.[337] The Japanese tried to continue this pattern of secured local command of the sea in any area where they intended to land forces. The initial seizure of outlying islands of the Philippines was in order to secure air bases to protect the invasion force before the main invasion some weeks later.

The operations during the China War had also resulted in the Japanese military gaining practical experience in making separate coordinated landings under cover of darkness. In addition, the Japanese had been able to field test their amphibious equipment under campaign conditions, making improvements to equipment as needed. With the outbreak of the Pacific War, Japanese forces had to conduct a series of rapid coordinated amphibious operations in order to secure the territories required to gain the Empire the resources it desperately wanted. In addition, territories had to be

[336] E. J. Drea, 'The Development of Imperial Japanese Army Amphibious Warfare Doctrine', in *In the Service of the Emperor: Essays on the Imperial Japanese Army*, Lincoln, 1998, p. 21.

[337] H. Long-hsuen and C. Ming-kai, *History of The Sino-Japanese War (1937 – 1945)*, Taipei, 1972, p. 263.

seized in order to act as staging points for later operations and to act as a defensive shield.

During the China War the Japanese had perfected the ability to make landings at the point of least resistance. This was facilitated by their control of China's littoral waters and the ability of the Japanese to gain air supremacy over the quantitatively and qualitatively inferior Chinese air force. Surprise was considered to be of greater value than using large scale naval bombardment. Airpower was used instead to soften up targets before a landing. The integration of airpower in Japanese operations was such that American wartime manuals refer to Japanese amphibious operations as being 'Aero-Amphibious' warfare.[338]

When the Japanese did encounter determined resistance, such as at Wake Island, or at Kota Bharu, it resulted in heavy Japanese casualties. To overcome determined enemy resistance Japanese commanders proved their willingness to sacrifice the lives of their troops in offensive operations.[339] The willingness of Japanese soldiers, sailors and airmen to lay down their lives was demonstrated throughout the war. Indeed Japanese troops would often commit suicide rather than face what they believed to be the humiliation of surrender.[340]

---

[338] *ONI 225 J Japanese Landing Operations and Equipment*, Washington, 1943, pp. 1, 2, 4.
[339] "The issue of victory lies in the constant maintenance of the offensive spirit" – partial conclusion of Japanese author cited in "Translations of Captured Documents on Lessons Learned by the Japanese in the Attack on Wake Island' in *ICPOA Bulletin No. 1-4,3 Japanese Land Forces No. 5* , p. 1.
[340] P. Warner, *Japanese Army of World War II*, Reading, 1973, p. 5.

Date	Location
7 December 1941	Landings at Kota Baru, Malaya and along Kra Isthmus, Thailand
8 December 1941	Battan Islands, Philippines
9 December 1941	Tarawa and Makin Atolls, Gillert Islands. Further landings in Malaya
10 December 1941	Guam, Northern Tip Luzon, Philippines, and Carniguin Island, Philippines
11 December 1941	Landing repulsed at Wake Island, Further Landings in Philippines
14 December 1941	Philippines Landings continue
16 December 1941	Landings at Sarawak and Brunei, Borneo
18 December 1941	Landing at Hong Kong
22 December 1941	Main Japanese Landings take place on Luzon, Lingayen Gulf, Philippines 150 miles NNW of Manila.
23 December 1941	Second, and successful landing at Wake Island
24 December 1941	Further landings in Philippines, south of Manila
11 January 1942	Landings at Manado, Celebes Islands, and Tarakan Island off east coast of Borneo
23 January 1942	Landings at Rabaul, Kavieng on New Ireland, Bougainville in Solomons, and Kendari in Celebes Islands
24 January 1942	Landings at Balikpapan, East coast of Dutch Borneo. Further Landings at Kendari.
25 January 1942	Landings at Lae, New Guinea
27 January 1942	Landings at Pemangkat, West coast, Dutch Borneo
30 January 1942	Japanese seize Dutch Naval base of Amboina
7 February 1942	Feint landing Pulua Ubin Island
8 February 1942	Main landings West Coast Singapore
14 February 1942	Parachute landing Palembang, Sumatra, NEI
20 February 1942	Landing Portuguese Timor
28 February 1942	Landings at Java, NEI
8 March 1942	Landings Lae and Salamaua, New Guinea
10 March 1942	Landings Finschhafen, Dutch New Guinea
1-20 April 1942	Landings Dutch New Guinea
6 April 1942	Landing Manus Island, Bismark Archipelago
10 April 1942	Landing Cebu Island, Philippines
16 April 1942	Landing Panay Island, Philippines
29 April 1942	Landing reinforcements Mindanao, Philippines
3 May 1942	Landing Tulagi, Solomons
5 May 1942	Landing Corregidor, Philippines

Table 4 Japanese Amphibious operations in the Pacific.[341]

The army's three designated and purpose trained amphibious divisions were used as infantry during the China War in order to

[341] Based on information in S. E. Morison, *History of United States Naval Operations in World War II: Volume III The Rising Sun In The Pacific 1931-April 1942*, Edison, 2001, and L. Morton, *United States Army In World War II: The War in the Pacific: The Fall Of The Philippines*, Washington, 1989.

meet the demand for troops.[342] Thus the majority of the early Japanese amphibious operations were conducted by troops unused to amphibious operations. Given the Army's high reliance on animal transport, [343] and the difficulties associated with unloading horses it is not surprising that problems occurred during the disembarkment of forces, particularly at night.

The invasion of Norway in 1939 by simultaneous amphibious and airborne landings inspired the creation of the Japanese Navy's own parachute forces to spearhead amphibious landings.[344] The purpose of these units was to vertically envelop an opposing force whilst a friendly amphibious force conducted its landing. Attempts by the Japanese to achieve this at Menado in January 1942, and at Palembang later in February were hampered – at Menado by the paratroops capturing the objective before the amphibious forces could arrive, and at Palembang by the stout resistance of the Anglo Dutch defenders.[345] The Japanese were not alone in failing to achieve coordination between amphibious and airborne units. German airborne operations in Norway had not been fully integrated with the amphibious component of the invasion, and the amphibious component of the invasion of Crete arrived only after airborne forces had captured the island.

The capture of Portuguese Timor by a combined amphibious and airborne force on February 23rd 1942 marks the first time that a vertical envelopment was successfully employed as part of an

[342] Drea, pp. 19-20.
[343] P. Jowett, *The Japanese Army 1931-1945 (1) 1931-42*, Oxford, 2002, pp 10-11.
[344] Rottman and Takizawa, p.7.
[345] R. A. Stewart, 'The Japanese Assault on Timor 1942', in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, p. 203.

amphibious operation. The cost was high with only 78 out of 308 paratroopers surviving the fighting.[346]

As the war progressed Japanese ability to conduct amphibious operations became more constrained. Amphibious assets were often employed more in the resupply of garrison forces rather than in offensive operations. The design of new classes of amphibious support ships such as the Nitto Yusokan reflected this change in priorities as it was designed to be fast enough to go between islands in the hours of darkness so as to be untroubled by Allied aircraft.[347]

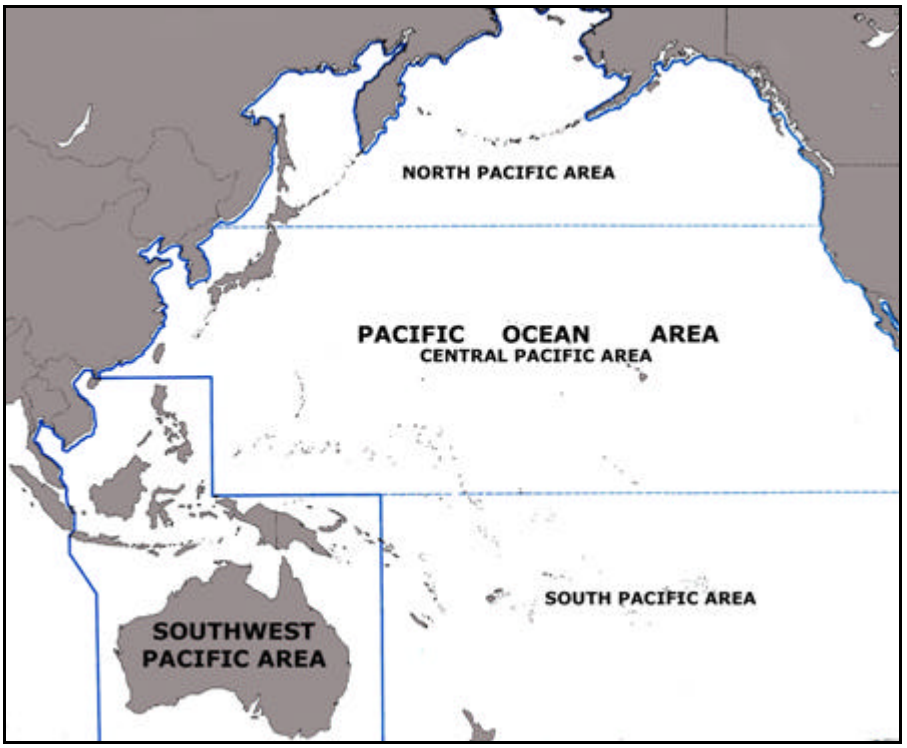
Japanese design approaches were often innovative, but were hampered by the low capacity of the Japanese war economy and the high demands placed upon it. This resulted in the gradual erosion of the technical superiority Japanese amphibious equipment had over its Allied counterparts at the beginning of the Pacific War. The ability of the Japanese to make full use of captured Allied equipment was also reduced due to Japan being a less industrialised society. With a much lower rate of motor vehicles per capita than any other major power (USA over 200 per thousand persons, Germany 16 per thousand persons, Japan fewer than one per thousand persons)[348] Japanese soldiers often could not operate motor vehicles unless they were part of a specialised unit. As a result the Japanese were forced to utilise prisoners of war to operate captured bulldozers in the Dutch East Indies because the Japanese soldiers did not know how to operate them. [349]

[346] Stewart, p. 209.
[347] N. Hancock, and R. Clauson, *Characteristics Of Japanese Naval Vessels: Article 10 Landing Craft*, n.p., 1946, p.19.
[348] Overy, R., *Why The Allies Won*, London, 1995, pp.224-225.
[349] K. Yoshikichi, "Korean Guard", p.115, in H. & T. Cook, *Japan At War: An Oral History*, London, 2000, p. 115.

Conversely, American forces at Guadalcanal encountered little difficultly in using captured Japanese equipment to finish the construction of Henderson Field. [350]

British operations

While British troops were never involved in conducting large scale amphibious operations in the Pacific theatre, troops from Britain's Pacific colonies, and the dominions of Australia, New Zealand, and Canada were.[351] With the fall of Singapore and the surrender of the Dutch East Indies, Allied command structures were revised, resulting in the creation of the South West Pacific Area (SWPA) and the Pacific Ocean Area (POA). The Pacific Ocean Area was further divided into Northern, Central, and Southern Areas.



[350]F. O. Hough, V. E. Ludwig, and H. I. Shaw, *Pearl Harbor To Guadalcanal: History of U.S. Marine Corps Operations in World War II Vol. I,* Washington, n.d. p. 274.
[351] Canada provided troops for the invasion of Kiska, Allied forces landing unopposed on August 15th 1943, the Japanese having evacuated unnoticed on July 28th 1943.

Figure 13 The Pacific Theatres.

Both of these areas were to have command structures that in theory gave all Allied forces in the region a role in decision making. In practice American Officers filled the senior positions in each structure.[352] As a result Australian and New Zealand forces were effectively under American control for the majority of their operations. Certainly for amphibious operations this was the case as both Australia and New Zealand were dependent on the United States Navy to provide logistical and combat support for these operations. Conversely, United States forces were dependent on both New Zealand and Australia as staging and basing areas, in addition to supplying foodstuffs in a form of reverse lend lease.[353]

The experiences of New Zealand and Australia in conducting amphibious operations in the Pacific are on the surface then quite similar. Both nations supplied ground forces that conducted numerous successful small and large scale operations with the direct support of the United States Navy, thus marking the first successful employment of either nation in amphibious operations since the debacle of Gallipoli. Like their American allies, Australian and New Zealand forces in the Pacific conducted numerous unopposed landings and reconnaissance missions. However a number of larger opposed landings were conducted, either to support other landings, or encircle and cut off Japanese positions.

However, beneath this lies two quite separate amphibious experiences – due directly to each nation's differing levels of scale

[352] US General MacArthur commanded the Southwest Pacific Area, and US Admiral Nimitz the Pacific Ocean Area.
[353] For an indepth and detailed discussion of this see Chapter V "Local Procurement in the Pacific", in A. P. Stauffer, *United States Army In World War II: The Technical Services: The Quartermaster Corps: Operations In The War Against Japan*, Washington, 1990.

and scope of commitment to operations in the Pacific. Both nations on the outbreak of war with Germany had committed their military efforts towards supporting Britain in waging a European war. With the outbreak of hostilities in the Pacific, Australia opted to bring its ground forces back from the Middle East, where they had served with distinction, in order to defend Australia from Japanese attack. Australia also raised additional forces, and started a crash industrialisation program in order to produce modern military materials .For Australia the war with Japan had become the main priority. New Zealand, however, decided to keep its troops in the Middle East, and raise additional forces for service in the Pacific. Ultimately, the ability to sustain a division in both the European and Pacific theatres was a luxury New Zealand could not maintain, leading to the demobilisation of its Pacific division in late 1944.[354]

Location	Date	Unit Involved
Vella Lavella	September 1943	NZ 14th Brigade
Treasury Islands (Mono Island)	October 1943	NZ 8th Brigade
Green Islands (Nissan Island)	February 1944	NZ 14th Brigade

Table 5 Major New Zealand amphibious Operations in the Pacific.[355]

New Zealand and its forces in the Pacific fell under the control of the Pacific Ocean Area, and had 3rd Division assigned as part of the US 1st Marine Amphibious Corps,[356] which operated as part of Third Amphibious Force. The New Zealand 3rd Division was never employed as a whole division in amphibious operations. Instead its

[354] O. A. Gillespie, *Official History of New Zealand in the Second World War 1939-45: The Pacific*, Wellington, 1952, pp. 202-203.
[355] Based on information in Gillespie, and in M. Wright, *Pacific War: New Zealand and Japan 1941-45*, Auckland, 2003.
[356] Gillespie, p. 125.

component brigades were used in separate landings.[357] As a result New Zealand operations were on a much smaller scale than those conducted by Australia. Partially this many have been a result of the total reliance the division had on American supporting organisations during amphibious operations, for unlike Australia, New Zealand did not form any of the supporting units required for amphibious warfare. In effect New Zealand forces were merely a substitute for American ground troops – albeit a highly regarded one.[358] The integration of New Zealand forces into the American chain of command was so complete that the commander of 3rd Division was at one stage appointed 'commanding General Allied forces Vella Lavella',[359] thus placing him in direct control of American forces.

While the amphibious operations conducted by New Zealand forces were small in scale, they were important in achieving the execution of the overall Allied strategy of isolating the Japanese garrison at Rabaul. New Zealand troops were transported, landed, and supported by the United States Navy in all of its actions, with all the landings being conducted using the American methods in which the division was trained in the New Hebrides.[360] The success of New Zealand's amphibious operations in the Pacific can thus be seen as further proof of the quality of American doctrine in conducting amphibious operations.

Australia, with its larger industrial base and population, was capable of sustaining the manpower demands of a larger army, forming the II Australian Corps, consisting of the 5th, 6th, 7th, and

[357] Gillespie, p. 121.
[358] Gillespie, p. 141.
[359] H. I. Shaw, and D. T. Kane, *Isolation of Rabaul: History of U.S. Marine Operations in World War II*, Washington, 1963, p.153.
[360] Gillespie, p. 116.

9th Divisions and their supporting assets. Both Australia and New Zealand raised, organised, and equipped their forces along British lines, but as Australia had a larger military, it was able to form the specialist amphibious support units that New Zealand was unable to.

Most important of these supporting amphibious units was the 1st Australian Combined Operations Section. Although small in size this unit had the responsibility of not just organising the training, planning, and co-ordination of Australian amphibious operations, but also for the dissemination and institutionalisation of amphibious warfare knowledge within the Australian military.[361] The section also oversaw the testing of new methods and equipment, in addition to receiving reports from Australian amphibious engineering and logistical support units on the operational performance of equipment and organisations for beach parties.

The Australian Combined Operations section was based on the British model and viewed amphibious operations as requiring the cooperation of all three services, and as such had personnel from the RAAF, RAN, and the Australian Army. In addition, the Australians were receiving reports from the British Combined Operations headquarters, which were detailed examinations of amphibious operations in Europe and suggestions for future improvements.[362]

[361]The function of this unit has been determined through a study of activities recorded in its War Diaries for the period September 1944 through to May 1945. Further support for this assumption is gained from the archiving of its war diaries as part of the Australian War Memorial's collection of Headquarter Units.

[362] Distribution list contained within the 1943 C.O.H.Q. Bulletin No: Y/1 "Notes on the Planning and Assault Phases of the Sicilian Campaign", a detailed 40 page report on Operation 'Husky'. Of 321 copies produced ten were sent to the Australian military. Multiple copies were sent to various American military establishments including the Marine Corps.

Operation	Where	When	Units Involved
Postern	Lae	Sept. 4 1943	Australian 9th Division
	Finschhafen	Oct. 2 1943	Australian 9th Division
Oboe One	Tarakan	May 1 1945	Australian 26th Brigade
Oboe Six	Labuan Island and Brunei	June 10 1945	Australian 9th Division (two brigades only)
Oboe Two	Balikpapan	July 1 1945	Australian 7th Division

Table 6 Major Australian Amphibious Operations in the Pacific[363]

The co-operation of the United States Navy in providing not just logistical and combat support for operations, but also the amphibious training of Australian Divisions was vital. The commanders and instructors of the 3rd Amphibious Training Group were primarily United States Naval Officers,[364] who taught American techniques for waterproofing equipment, dealing with unloading supplies, evacuating casualties, signal traffic, and using LSTs.

Both British and American thinking thus influenced the development of an Australian amphibious doctrine. In practical terms this resulted in a largely cosmetic usage of British nomenclature, such as referring to shore parties as either 'beach groups' or even commandos, while making use of American innovations such as palletization and fork lift trucks to aid cargo handling.[365]

[363] Based on information in G. H. Gill, Australia In The War Of 1939-1945 Series Two Navy Volume II Royal Australian Navy, 1942-1945, Canberra, n. d.
[364] AWM52 *Australian Military Forces, Army Headquarters, Formation and Unit Diaries, 1939-1945 1/11/2 Miscellaneous 1 Australian Combined Operations Section September 1944 – May 1945*, p. 38.
[365] AWM52 *Australian Military Forces, Army Headquarters, Formation and Unit Diaries, 1939-1945 1/11/2 Miscellaneous 1 Australian Combined Operations Section June – September 1945*, p.40.

As Australia fell within the authority of the SWPA, Australian amphibious operations were conducted under the control of the 7th Amphibious Force, which was commanded by an American Admiral. Despite having their own amphibious support units, the Australians were still dependent on the United States Navy providing logistical and combat support for operations.

With the adoption of the 'Germany First' policy by the Allies at the January 1943 Casablanca conference,[366] Australian requirements for landing craft for use in the Pacific became a lower priority. Throughout the war production of landing craft would be outstripped by the demand for them in each theatre.[367] In order to satisfy the requirements of their own forces, Australia produced a series of locally designed and built landing craft. The Australian craft were broadly based on Allied designs then currently in service, being shallow draft, bow ramped craft, designed to beach and discharge their cargo on the shore.[368] Australian forces in New Guinea also used captured Japanese craft.[369]

[366] A. Bryant, *The Turn Of The Tide 1939-1943*, London, 1957, pp.5559-560.
[367] S. E. Morison, *American Contributions To The Strategy Of World War II*, London, 1958, p. 50.
[368] ONI 226/1, p.31.
[369] The AWM Photo collection contains many pictures of Japanese landing craft being used by Australian Forces. See Photos 013324, 150985, 026639, 026640, 0226641, and 069261.

Photo 1. Australian gunners unload artillery off a Japanese Daihatsu Type 'A' Landing Craft captured at Milne Bay, New Guinea. (Source AWM collection 069260)

Initially, US General MacArthur, commander of the SWPA, used Australian ground troops for amphibious operations, as they were the only troops available to him in sufficient numbers. As the number of American divisions available in the Pacific increased, Australian units were relegated to relieving American garrisons and conducting operations to liberate Dutch and British territory. Some historians have suggested that MacArthur had a political motive in not wanting to use Australian troops in the liberation of the Philippines, as he wished it to be a solely American affair.[370]

Amphibious operations were conducted by both Australia and New Zealand, but were heavily reliant on American logistical and combat support. The amphibious operations conducted by Australian and New Zealand forces were conducted using American methods, rather than British methods. Interservice, and inter-Allies cooperation in these operations were excellent, with both the

[370] D. Horner, "The ANZAC contribution Australian and New Zealand in the Pacific War" in *The Pacific War: From Pearl Harbor to Hiroshima*, Oxford, 2006, p. 152.

Australian, and New Zealand,[371] official histories praising the role played by the United States Navy in planning and conducting these operations.

As the war in Europe drew to a close, the British started to negotiate with the United States over the sending of a Royal Navy taskforce to the Pacific. While the amphibious assets of this taskforce posed little difficulty with integration into American forces, some questions were raised over the suitability of Royal Navy capital surface units for joint operations in the Pacific.[372] The major concern raised by United States Admiral King was the limited endurance of the British ships and their inability to replenish at sea via US Navy methods.[373] A Royal Navy task force did take part in Operation 'Iceberg', the invasion of Okinawa; however it did so as part of an American operation conducted according to American methods. As the Australian and New Zealand amphibious experiences had shown, United States forces were able to work smoothly with their Allies – provided their Allies used American methods.

An American War

The Pacific War against Japan was the war that the United States Marine Corps had been planning for since nearly twenty years before. But before the principles enshrined in successive editions of War Plan Orange and outlined in Ellis's Operational Plan 712 could be enacted, the Japanese advance needed to be halted and contained. While still keeping to the formula of defeating 'Germany

[371] The NZ Official history states that on the US Commander of the operation against the Treasury Islands "had every reason to congratulate himself on his accurate and exhaustive planning", Gillespie p.154.
[372] N. E. Saratakes, "The Short but Brilliant Life of The British Pacific Fleet", *JFQ*, issue 40, 1st Quarter, 2006, p. 87.
[373] US Navy vessels replenished parallel to tankers, while RN ships replenished astern. The US Navy system is quicker and can allow two ships to replenish at once.

First', the Allies started to conduct a series of counter offensives. US Admiral King built up forces in the Pacific while still maintaining a strong presence in the European theatre. The United States would emerge as the dominant partner in the Pacific as it provided the bulk of the naval forces and materiel needed to prosecute the conflict. This build-up of naval forces was necessary even to maintain parity with Japanese forces after their early successes.

However wars are not won by maintaining the status quo, they are won by destroying the enemy's forces and their ability to sustain their forces in the field. Operation Watchtower, the seizure of Guadalcanal, marked the first step in doing that, but it also revealed flaws in the execution of American amphibious doctrine, particularly in the haphazard loading and unloading of supplies and equipment. Despite the emphasis of *FTP-167* laid on the importance of logistics, the first wartime test revealed the execution of those principles was lacking.

Operation	**Landing Force**	**When**	**Where**
Watchtower	1st Marine Division	7 Aug 1942	Guadalcanal, Tulagi
Dipper	3rd Marine Division	1 Nov 1943	Bougainville
Galvanic	2nd Marine Division	20-Nov-43	Tarawa
Backhand	1st Marine Division	26-Dec-43	New Britain
Flintlock	4th Marine Division	31-Jan-44	Roi-Namur
Catchpole	Tactical Group 1	18-Feb-44	Eniwetok Atoll
Appease	5th Marine Regt	5 March 1944	Volupai-Talasea
Forager	2nd and 4th Marine Divisions	15-Jun-44	Saipan
	3rd Marine Division	21-Jul-44	Guam
Stalemate	1st Marine Division	15-Sep-44	Peleliu
Detachment	4th and 5th Marine Divisions	19-Feb-45	Iwo Jima
Iceberg	1st and 6th Marine Divisions	1 April 1945	Okinawa
	4th Marine Regt	4 June 1945	Oroku Peninsula

Table 7. Major US Marine Landings in the Pacific Theatre.[374]

Before Tarawa, Allied operations in the Pacific were hastily organised counter offensives. The Guadalcanal operation had been launched as a response to Japanese attempts to create an airbase there.[375] Tarawa marked the beginning of the Central Pacific drive towards Japan that was the keystone of the prewar 'Orange' war plan.

Operation	Landing Force	When	Where
Landcrab	7th Infantry Division	11-May-43	Attu
Toenails	43rd Infantry Division	30-Jun-43	New Georgia
	1st Raider Regt	5-Jul-43	Rice Anchorage
	35th Infantry Regt	15-Aug-43	Vella Lavella
	172nd Infantry Regt	27-Aug-43	Arundel Island
Galvanic	165th Infantry Regt	20-Nov-43	Makin Atoll
Dexterity	112th Cavalry Regt	15-Dec-43	Arawa New Britain
Flintlock	7th Infantry Division	31-Jan-44	Kwajalein
Brewer	1st Cavalry Division	29-Feb-44	Admirality Islands
Persecution	163rd Infantry Regt	22-Apr-44	Aitape, New Guinea
Reckless	24th and 41st Infantry Divisions	22-Apr-44	Hollandia, New Guinea
Straightline	163rd Infantry Regt	17-May-44	Wakde-Sarmi, New Guinea
Horlicks	41st Infantry Division	27-May-44	Biak Island
Cyclone	158th Inf Regt	2-Jul-44	Noemfoor Island
Globetrotter	6th Inf Division	30-Jul-44	Sansapor, New Guinea

[374] Based on information in G. L. Rottman, *US World War II Amphibious Tactics: Army & Marine Corps, Pacific Theater*, Oxford, 2004.

[375] R. B. Frank, *Guadalcanal: The Definitive Account of the Landmark Battle*, New York, 1990, p. 31.

Daredevil	31st Infantry Division	15-Sep-44	Morotai Island
Stalemate	77th Infantry Division	17-Sep-44	Angaur

Operation	Landing Force	When	Where
King II	7th, 24th and 96th Infantry Divisions, 1st Cavalry Division	20-Oct-44	Leyte, Philippines
Love III	24th Infantry Division	15-Dec-44	Mindoro, Philippines
Mike I	6th, 37th, 40th, and 43rd Infantry Divisions	9-Jan-45	Luzon, Philippines
Mike VI	38th Infantry Division	29-Jan-45	Zambales, Philippines
	11th Airborne Division	31-Jan-45	Nasugary Bay, Philippines
	503rd Parachute Regt, 34th Infantry Regt	16-Feb-45	Corregidor, Philippines
Victor III	186th Infantry Regt	28-Feb-45	Palawan, Philippines
Iceberg	77th Infantry Division	26-Mar-45	Kerama Retto
		16-Apr-45	le Shima
Victor IV	41st Infantry Division	10-Mar-45	Mindanao, Philippines
	163rd Infantry Regt	16-Mar-45	Jolo, Philippines

Table 8. Major US Army Amphibious Landings in the Pacific.[376]

The majority of American amphibious landings took place in Pacific theatre. The United States Army took part in only thirteen major opposed landings in both the European and Mediterranean theatres

[376] Based on information in G. L. Rottman, *US World War II Amphibious Tactics: Army & Marine Corps, Pacific Theater,* Oxford, 2004, and J. A. Lorelli, *To Foreign Shores*, Annapolis, 1995.

combined.[377] But in both theatres the preference was for daylight landings with the benefit of mass naval gunfire and close air support – exactly the techniques outlined in *FTP-167* back in 1938. Given that the Marines trained the first two US Army Divisions in 1940,[378] and that the US Army adopted *FTP-167* as FM 31-5, its manual on amphibious warfare, it is only natural that operations in both theatres placed a high value on naval gunfire support.

As each successive operation became increasingly complex both in size and scope, further refinements were made to the execution of *FTP-167's* core doctrine. Techniques of naval gunfire support were improved and perfected, as were the methods of close air support. In logistics improvements were made not just with the tools of cargo handling but with the techniques in using them. Operation Galvanic was to be the 'spawning ground' of modern amphibious warfare, as it was at Tarawa that hard lessons were learnt – primarily, that a frontal amphibious assault against a fortified atoll was possible, but that it would cost lives. Tarawa proved the doctrine, all that remained was to refine the techniques.[379]

After Tarawa, training grounds were created based on the Japanese defences, both for ground units and for naval units engaged in gunfire support. Feedback was sought on every aspect of the operation. The staff of 2nd Marine Division, when compiling its after-action report, questioned subordinate commanders on

[377] G. L. Rottman, *US World War II Amphibious Tactics: Mediterranean & European Theaters*, Oxford, 2006, p. 11.
[378] J. A. Isely and P. A. Crowl, *The U.S. Marines and Amphibious War: Its Theory and Its Practise in the Pacific*, Princeton, 1951, p. 3.
[379] Alexander, *Utmost Savagery*, p. 243.

topics ranging from combat operations to the performance of cargo pallets under fire.[380]

Intelligence information on Japanese weapons, tactics, and organisation was distributed throughout the Allied forces, as were the reports of troops who had fought the Japanese in various campaigns. The British usage of amphibious commando raiding forces was also closely studied by the United States, particularly by the Marines who developed their own Marine raider units as a result of British wartime experience and success.[381] The employment of raiding and reconnaissance units became increasingly vital to gain geographical and hydrographical data on landing sites, remove underwater defences, and provide diversions.[382]

As new equipment became available, new uses and adaptations were made to it. The LVT began as an unarmoured cargo carrier. At Tarawa it became an amphibious armoured fighting vehicle, transporting troops directly to the fighting. LVTs would gradually gain more armour and firepower, allowing them to support landing operations with direct fire and engage enemy forces ashore.

With the prospect of an invasion of Japan, and the advent of the atomic bomb, consideration was given to the tactical use of nuclear weapons to support the landings. The employment of up to nine

[380] *FMFRP 12-90 Second Marine Division Report on Gilbert Islands Tarawa Operation*, Washington, 1991, pp. 9-11 (reprint of original 1943 report).
[381] G. Rottman, *US Marine Corps 1941-45*, Oxford, 2004, p.27.
[382] For an indepth analysis of the importance of such activity in the Pacific see R. C. Williams, "Amphibious Scouts and Raiders", in *Military Affairs*, Vol. 13, No. 3, Autumn, 1949, pp. 150-157.

bombs was considered,[383] giving a taste of the postwar planning concerns of the NBC[384] battlefield.

Lessons Learnt

The Pacific War provided the spawning ground for modern amphibious warfare. The frank appraisals of failures and successes during the war by US officers allowed the prewar doctrine to be refined, and for the creation of new equipment to fill niche roles identified by actual operations. The perfection of 'storm landings' by the United States allowed the creation of a new form of force projection with global reach. The creation of self-sustaining task forces, with both the combat and logistic elements needed to seize and hold an objective across thousands of miles of ocean, was a staggering achievement. And it is this achievement that marked the evolution of amphibious warfare from merely being the projection of military power ashore.

This evolution was a result of the prewar doctrine developed by the US Marines for conducting the objectives laid out in War Plan Orange, and clearly identified in Ellis's prewar studies. The refinements to this basic doctrine were made not only as a result of operational experience, but also by the availability of new technology. The ability to use amphibious warfare in its highest form of force projection would necessitate having the logistical and military infrastructure to support such an operation. The ability to immediately project amphibious force globally would become one of the hallmarks of a superpower during the Cold War.

[383] T. B. Allen, and N. Polmar, *Codename Downfall: The Secret Plan to Invade Japan*, London, 1996, pp. 314-315.
[384] Nuclear, Biological, Chemical.

The foundations for further development were also laid during the Pacific War. The success of the Japanese at Timor in using parachute troops to vertically envelop the defenders in support of the amphibious landing was to pave the way for future operations. While German operations showed the potential of such operations, it was at Timor where the principle was first executed successfully. The successful use of airborne forces to support Allied landings in Europe further reinforced that success.

Studies of Japanese equipment and operations were made both during and after the war, with technical missions sent as part of the Allied occupation forces. Japanese designs that fused together the concept of the amphibious warfare ship and the aircraft carrier are echoed in many post-war designs. With the further development of the helicopter during the late 1940s and 1950s, the concept of the helicopter carrier was born. This was a result of the success of vertical envelopment in supporting amphibious operations during the war, but also of the desire of the US Marines to provide a purely naval solution to global force projection in the nuclear age.[385]

Conclusion

Successful amphibious operations are the result of careful planning and preparation, in conjunction with skilful execution. Not only does the enemy have to be defeated, but major physical barriers have to be overcome to ensure success. The vast distances of the Pacific presented all combatants with major geographical challenges that forced the development of streamlined logistical systems to support operations across vast stretches of ocean.

[385]HAF Box 41, Folder 744, Anon., *Special Equipment for Amphibious Operations,* n.p., 1946, p.1.

All three of the powers looked at in this study had strong traditions of successful amphibious operations prior to World War One. The military and naval innovations of the nineteenth century had greatly benefited the navies and militaries of all three and had provided the tools needed to conduct these operations. On the eve of World war One these improvements made large scale amphibious operations more practical.

British amphibious failures at Tanga and Gallipoli were the result of poor planning and execution, rather than proof of the impossibility of amphibious operations in the face of machine guns and quick firing artillery. However, the latter was the conclusion that was widely drawn in the interwar period. This was despite German success in the Baltic that occurred under similar technical and operational constraints. In addition the Franco-Spanish landings at Alcuhumas Bay in 1925 were conducted using similar equipment to that available to the British at Gallipoli.

The belief that airpower had made amphibious operations redundant was also widespread after World War One, especially in Britain where the Royal Air Force was determined to firmly establish itself as a third service. This desire by the RAF to establish itself resulted in its opposition to amphibious operations as being a viable form of force projection. Conversely, the USMC was motivated both before and after World War Two to create amphibious warfare as being both important and as its specialist niche role.

The reverse engineering of Gallipoli by the USMC allowed it to create an amphibious doctrine that formed the basis of US amphibious operations during World War Two. The American War

Plan Orange allowed the USMC to create a specialist amphibious role for itself during wartime, particularly in any conflict with Japan. As a result USMC doctrine was assault focused with much emphasis on the way of planning and conducting operations, but still lacking on the eve of the war adequate means to implement these operations. As the war continued the equipment required was produced, first as a result of copying Japanese designs, and then as a result of British influences.

Japanese amphibious developments and experiences in the interwar period resulted in the production of equipment that was both innovative and superior to that of the Allies at the beginning of the Pacific War. However Japan had failed to produce a doctrine capable of conducting amphibious assaults in the face of determined opposition – Japanese operations relying heavily on the élan of their troops rather than superior planning and preparation.

As a result of these respective interwar preparations, the United States entered World War Two with superb doctrine and adequate equipment, Japan with adequate doctrine and superb equipment, and the British with neither.

American systems of logistics gave the means of sustaining operations across long distances and in areas with limited infrastructure, often by producing the infrastructure required. In the Pacific, where often a force would have to bring its own drinking water, this ability to maintain long lines of communication was a factor vital to victory.

The combination of American amphibious doctrine and logistic capabilities and developments resulted in the creation of self-

contained task forces capable of conducting 'storm landings'. The United States made deliberate efforts to learn from each successive amphibious operation in order to improve the next. The continual successes of the Americans during the campaigns of the Central Pacific drive was a direct result of this process, building upon the solid doctrinal base developed during the interwar period.

Japanese innovations in the field of amphibious warfare were handicapped by their limited industrial base and by a lack of opportunities as military reverses forced them towards a policy of reactive and defensive operations. Even so, Japanese designs and planning showed a desire to integrate airpower closely with their operations, to the extent of producing ships that combined the features of both aircraft and landing craft carriers. In the immediate postwar period the Americans closely studied Japanese designs and equipment, a practice that had first occurred in the interwar period.

The geographical and logistical challenges of waging war in the Pacific provided the stimulus for revolutionising the way future amphibious operations would be conducted both in terms of the equipment used and in the way it would be employed. The Pacific War saw the creation of new machines and new methods for conducting amphibious operations that were the foundation of the postwar successes of both the United Nations at Inchon in 1950, and the British in the Falklands War.

Primary sources

Anon. *FMFRP 12-90 Second Marine Division Report on Gilbert Islands Tarawa Operation*, Washington, 1991 (reprint of original 1943 report)

Anon., *C.O.H.Q. Bulletin No: Y/1 'Notes on the Planning and Assault phases of the Sicilian Campaign'*, n.p., 1943.

Anon., *Air Publication 1300 Royal Air Force War Manual Part I. – Operations*, n.p., 1938.

Australian War Memorial (AWM)52 *Australian Military Forces, Army Headquarters, formation and unit diaries, 1939-1945 1/11/2 Miscellaneous 1 Australian Combined Operations Section September 1944 – May 1945*

AWM52 *Australian Military Forces, Army Headquarters, formation and unit diaries, 1939-1945 1/11/2 Miscellaneous 1 Australian Combined Operations Section June – September 1945*.

Ellis, E. H., *FMFRP 12-46 Advanced Base Operations in Micronesia*, Washington, 1992 (reprint of original 1921 report)

Historical Amphibious File (HAF) 43 *Text for Landing Operations 1931*, letter from The Major General Commandant, To The Commandant Marine Corps Schools. 20th October 1931.

HAF Box 2 Folder 51, Krulak, V. H., *Report on Japanese Landing Operations Shanghai Area 1937*, Shanghai, 1938.

HAF Box 21, Folder 11, Anon., 'Translations of Captured Documents on Lessons Learned by the Japanese in the Attack on Wake Island' in *ICPOA Bulletin No. 1-43 Japanese Land Forces No. 5*, n.p., n.d.

HAF Box 3, Folder 73, Gally, B. W., *A History of the U.S. Fleet Landing Exercises*, n.p. 1939.

HAF Box 34, Folder 638(5), Anon., *Tentative Changes In FTP-167*, n.p., 1940.

HAF Box 35, Folder 654, Oates, C.S., *A Critical Analysis of Japanese Operations against Shanghai in 1932, and the results thereof*, Quantico, 1935.

HAF Box 39, Folders, 718A-C, Borg-Warner Corporation, *Research, Investigation & Experimentation in the field of Amphibian Vehicles*, Kalamazoo, 1957.

HAF Box 4, Folder 123, Anon, *Japanese Landing Boats Shanghai, 1937, data collected by USS BULMER*, n.p., 1937.

HAF Box 4, Folder 123, Krulak, V. H., *The design and Procurement of Suitable Landing Boats*, n.p., 1939.

HAF Box 4, Folder, 127, Brown, M. G., *Japanese Special Landing Force Boats And Boat Ships*, n.p., 1939.

HAF Box 41 Folder 744, Anon., *Special Equipment for amphibious Operations*, n.p., 1946.

HAF Box 45, Folder 807, Griffith, S. W. and Greene, W. M., *Report on Combined Operations Training Centre, Inverary, Argyllshire, Scotland 7-19 December 1941*, n.p.,1942.

HAF Box 7, Folder 180, Anon., *Tentative Landing Operations Manual*, Washington, 1935.

Hancock, N. and Clauson, R., *JM-200-H S-01-10 Characteristics Of Japanese Naval Vessels: Article 10 Landing Craft*, n.p., 1946.

Patton, G. S., *Historical Study of Landing Operations*, Fort Shafter, 1935.

RN Naval Intelligence Division, *B.R. 519 Geographical handbook Series: Pacific Islands Vol. I General Survey*, London, 1945.

RN Naval Intelligence Division, *B.R. 519 Geographical handbook Series: Pacific Islands Vol. II Eastern Pacific*, London, 1943.

RN Naval Intelligence Division, *B.R. 519 B Geographical handbook Series: Pacific Islands Vol. III Western Pacific (Tonga to the Solomon Islands)*, London, 1944.

RN Naval Intelligence Division, *B.R. 519 C Geographical handbook Series: Pacific Islands Vol. IV Western Pacific (New Guinea and Islands Northward)*, London, 1945.

US Navy, *FTP-167 Landing Operations Manual*, Washington, 1938.

US Navy, *ONI 225 J Japanese Landing operations and equipment*, Washington, 1943.

US Navy, *ONI 226 Allied Landing Craft and Ships*, Washington, 1944 reprinted in Baker, A. D., *Allied Landing Craft of World War Two*, London, 1985.

US Navy, *Joint Publication 3-02 Joint Doctrine for Amphibious Operations*, Washington, 2001.

USMC, *Staff Officers' Field Manual for Amphibious Operations (especially as it pertains to the Pacific Ocean Area) Organization, Technical and Logistical data*, Washington, 1944.

Secondary sources

Official Histories

Anon, *War Record*, Wellington, 1946.

Anon., *United States Army In World War II: The War In The Pacific Atlas*, Harrisburg, 1998.

Aspinall-Oglander, C. F., *History of The Great War: Military Operations Gallipoli Vol. 1: Inception of the Campaign to May 1915*, London, 1992.

Elphinstone, H. C., *Siege of Sebastopol 1854-5: Journal of the Operations Conducted by the Corps of Royal Engineers Part 1*, London, 1859.

Gill, G. H., *Australia In The War Of 1939-1945: Series Two Navy Volume II Royal Australian Navy, 1942-1945*, Canberra, n.d.

Gillespie, O. A., *Official History of New Zealand in the Second World War 1939-45: The Pacific*, Wellington, 1952.

Hough, F. O., Ludwig, V. E., and Shaw, H. I., *Pearl Harbor To Guadalcanal: History of U.S. Marine Corps Operations in World War II Vol. I*, Washington, n.d.

Shaw, H. I., and Kane D. T. *Isolation of Rabaul: History of U.S. Marine Operations in World War II Vol. II*, Washington, 1963.

Shaw, H. I., Nalty, B. C., and Turnbladh, *Central Pacific Drive: History Of U.S. Marine Corps Operations In World War II Vol. III*, Washington, 1966.

Stauffer, A. P., *United States Army In World War II The Technical Services: The Quartermaster Corps: Operations In The War Against Japan*, Washington, 1990.

Long-hsuen, H. and Ming-kai, C. *History of The Sino-Japanese War (1937 – 1945)*, Taipei, 1972.

Morison, S. E., *History of United States Naval Operations in World War II: Volume III The Rising Sun In The Pacific 1931-April 1942*, Edison, 2001.

Morison, S. E., *History of United States Naval Operations in World War II: Volume IV Coral Sea, Midway And Submarine Actions May 1942-August 1942*, Edison, 2001.

Morison, S. E., *History of United States Naval Operations in World War II: Volume V The Struggle For Guadalcanal August 1942-February 1943,* Edison, 2001.

Morison, S. E., *History of United States Naval Operations in World War II: Volume VII Aleutians, Gilberts and Marshalls June 1942 – April 1944*, Chicago, 2002.

Morison, S. E., *History of United States Naval Operations in World War II: Volume VIII New Guinea and the Marianas March 1944 – August 1944*, Chicago, 2002.

Morison, S. E., *History of United States Naval Operations in World War II: Volume XII Leyte June 1944 – January 1945*, Chicago, 2002.

Morison, S. E., *History of United States Naval Operations in World War II: Volume XIII The Liberation Of The Philippines 1944-1945*, Edison, 2001.

Morison, S. E., *History of United States Naval Operations in World War II: Volume XIV Victory in the Pacific*, Chicago, 2002.

Morton, L., *United States Army In World War II: The War in the Pacific: The Fall Of The Philippines*, Washington, 1989.

Williams, K., *Army Air Forces Historical Studies No: 45: Development of the South Pacific Air Route*, n.p., 1946.

Books

Adcock, A., *WWII US Landing Craft*, Carrollton, n.d.

Alexander, J. H., *Storm Landings: Epic Amphibious Battles in the Central Pacific*, Annapolis, 1997.

Alexander, J. H., *Utmost Savagery: The Three Days of Tarawa* , Annapolis, 1995.

Allen, B. A. and Polmar, N., *Codename Downfall: The Secret Plan to Invade Japan*, London, 1996.

Anon, *The Times World Atlas*, London, 2005.

Atkinson, J., *Landing Craft from 1926*, n.p., n.d.

Bacon, R., *The Dover Patrol 1915-1917 Vol. I*, New York, 1919.

Barber, L. and Hensha ll, K., *The Last War of Empires: Japan and the Pacific War*, Auckland, 1999

Beevor, A., *The Spanish Civil War*, London, 1999.

Barker, A. J., *Japanese Army Handbook 1939-1945*, London, 1979.

Brooks, R., *The Royal Marines 1664 to the present*, Annapolis, 2002.

Bryant, A., *The Turn Of The Tide 1939-1943*, London, 1957,

Bullard, S., (translator), *Japanese Army Operations In The South Pacific Area: New Britain and Papua campaigns, 1942-43*, Canberra, 2007.

Cawthorne, N., *History's Greatest Battles: Masterstrokes of War*, London, 2005.

Chesneau, R., *Conway's All The World's Fighting Ships 1922-1946*, London, 1980.

Clifford, K. J., *Amphibious Warfare Development in Britain and America from 1920-1940*, Laurens, 1983.

Durnford -Slater, J., *Commando* , London, 1955.

Dyer, G. C., *FMFRP 12-109 The Amphibians Came To Conquer Vol. I*, Washington, 1991.

Edwards, H. W., *A Different War: Marines in Europe and North Africa*, Washington, 1994.

Evans, D. C. and Peattie, M. R., *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941*, Annapolis, 1997.

Evans, M. H. H., *Brassey's Sea Power: Naval Vessels, Weapon Systems and Technology Series, Volume 4, Amphibious Operations: The Projection of Sea Power Ashore*, London, 1990.

Ferguson, B., *The Watery Maze: The Story of Combined Operations*, London, 1961.

Fletcher, D., *Swimming Shermans: Sherman DD amphibious tank of World War II*, Botley, 2006.

Foss, C. F., *World War II Tanks and Fighting Vehicles*, London, 1981.

Frank, R. B., *Guadalcanal: The Definitive Account of the Landmark Battle*, New York, 1992.

Friedman, N., *U.S Amphibious Ships and Craft: An Illustrated Design History*, Annapolis, 2002.

Gardiner, R., (editor), *Conway's All The World's Fighting Ships 1922-1946*, London, 1980.

Gilbert, M., *A History Of The Twentieth Century Volume One: 1900-1933*, London, 1997.

Glover, M., *Wellington's Peninsular Victories, London,* London, 1963.

Gordon, G. A. H., *British Seapower and procurement between the Wars: A Reappraisal of Rearmament*, London, 1988.

Gray, R., (editor), *Weapons; An international encyclopedia from 5000BC to 2000AD*, London, 1990.

Hall, T., *D-Day Operation Overlord*, London, 1993.

Harclerode, P., *Wings Of War: Airborne Warfare 1918-1945*, London, 2006.

Haythornthwaite, P. J., *The Napoleonic Source Book*, London, 1990.

Haythornthwaite, P. J., *The Colonial Wars Source Book*, London, 1997.

Hogg, I. V., *The Encyclopedia of Infantry Weapons of World War II*, London, 1977.

Hogg, I., and Weeks, J., *The Illustrated encyclopedia Of Military Vehicles*, Sydney, 1980.

Hoyte, E. P., *Japan's War: The Great Pacific Conflict 1853-1952*, London, 1987.

Isely,J. A. and Crowl, P. A., *The U.S. Marines And Amphibious War: Its Theory, and Practise in the Pacific*, Princeton, 1951.

Jowett, P., *The Japanese Army 1931-1945 (1) 1931-42*, Oxford, 2002.

Keegan, J., *The Second World War*, London, 1989.

Keegan, J., *The Price of Admiralty: The Evolution of Naval Warfare*, New York, 1990.

Keyes, A. F., *Amphibious Warfare and Combined Operations*, London, 1943.

Lorelli, J. A., *To Foreign Shores*, Annapolis, 1995.

Marston, D., *Essential Histories: The Seven Years War*, Oxford, 2001.

Massie, R. K., *Dreadnought: Britain, Germany, And The Coming Of The Great War*, London, 1993.

Merriam, R., *Japanese Landing Craft of World War II: U.S. Naval Technical Mission to Japan*, Bannington, 2006.

Miller, E. S., *War Plan Orange: the U.S strategy to defeat Japan, 1897 – 1945*, Annapolis, 1991.

Mordal, J., *Twenty-Five Centuries of Sea Warfare* , London, 1965.

Moorehead, A., *Gallipoli*, Ware, 1997.

Morison, S. E., *American Contributions To The Strategy Of World War II*, London, 1958.

Morison, S.E., *The Two-Ocean War: A Short History of the United States In The Second World War*, Boston, 1963.

Overy, R., *Why The Allies Won*, London, 1995.

Pipes, R., *Russia Under The Bolshevik Regime 1919-1924*, London, 1997.

Plunkett, E., *Past and Future of The British Navy*, London, 1846.

Polmar, N. and Mersky, P., *Amphibious Warfare: An Illustrated History*, London, 1988.

Richmond, H., *Amphibious Warfare in British History*, Exter,1941.

Richmond, H., *British Strategy Military & Economic: A Historical Review and its Contemporary Lessons*, London, 1941.

Rottman, G. and Takizawa, A., *Japanese Parachute Forces of World War II*, Oxford, 2005.

Rottman, G., *US World War II Amphibious Tactics: Army & Marine Corps, Pacific Theater*, Oxford, 2004.

Rottman, G., *US World War II Amphibious Tactics: Mediterranean & European Theaters*, Oxford, 2006.

Rottman, G., *US Marine Corps 1941-45*, Botley, 2004.

Sakai, S., Caidin, M., and Saito, F., *Samurai*, London, 1960.

Shaw, H. I., *Opening Moves: The Marines Gear Up for War*, Washington, 1991.

Sherrod, R., *Tarawa: The story of a battle*, Fredericksburg, 1985.

Smith, H. M. and Finch, P., *Coral and Brass*, New York, 1949.

Speller, I. and Tuck, C., *Strategy and Tactics: Amphibious Warfare*, Staplehurst, 2001.

Stanley,R. M., *Prelude to Pearl Harbor*, New York, 1982.

Strahan, J. E., *Andrew Jackson Higgins and the Boats that won World War II*, Baton Rouge, 1994.

Tschischwitz, *The Army and Navy during the Conquest of the Baltic Islands in October, 1917*, Washington, 1933.

Tsuji, M., *Singapore: The Japanese Version*, London, 1966.

Urban, M., *Rifles: Six years with Wellington's legendary sharpshooters*, London, 2003.

USMC, *Marine Corps History*, Quantico, 1962.

Warner, P., *Japanese Army of World War II*, Reading, 1973.

Weeks, J., *Infantry Weapons*, London, 1972.

Wilson, T., *The Myriad Faces of War*, Cambridge, 1986.

Wrangel, P. N., *Always with Honour*, New York, 1957.

Wright, M., *Pacific War: New Zealand and Japan 1941-45*, Auckland, 2003.

Zaloga, S., *Amtracs: US Amphibious Assault Vehicles*, London, 1987.

Articles and Essays

Alexander, J. H., "Across the Reef: Amphibious warfare in the Pacific", in *The Pacific War: From Pearl Harbor to Hiroshima*, Botley, 2006, pp. 195-210.

Allen, L., "Notes on Japanese Historiography: World War II", *Military Affairs*, Vol. 35, No. 4, Dec. 1971, p. 133-138.

Anderson, B., "The naval strategy of the Civil War", *Military Affairs*, Vol. 26, No. 1, Spring 1962, pp. 11-21.

Anon., "RMASC Centaur", *After The Battle*, No. 18, 1977, p. 50-53.

Bittner, D. F., “Britannia’s Sheathed Sword: The Royal Marines and Amphibious Warfare in the Interwar Years – A Passive Response”, *The Journal of Military History*, Vol. 55, No. 3, Jul., 1991, p. 345-364.

Brown, D. K., ‘Sir Rowland Baker, RCNC’, in *Warship 1995*, London, 1995, p. 141-154.

Chapman, J., ‘The “Have-Nots” Go To War The Economic & Technical Basis of The German Alliance with Japan’, *International Studies 1984/III The Tripartite Pact Of 1940: Japan, Germany And Italy*, 1984, pp. 25-73.

Crowl, P.A., “Alfred Thayer Mahan: The Naval Historian”, in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, Princeton, 1996, p. 444-154.

Drea, E.J., ‘The Development of Imperial Japanese Army Amphibious Warfare Doctrine’, in *In the Service of the Emperor: Essays on the Imperial Japanese Army*, Lincoln, 1998, pp. 14-25.

Erickson, E.J., “Ottoman Military Effectiveness at Gallipoli, 1915”, *The Journal of Military History*, 65, October, 2001, pp. 981-1011.

Falls, C. “Geography and War Strategy”, *The Geographical Journal*, Vol. 112, No. 1/3, Jul.-Sep., 1948, p. 4-18.

Fedorak, C. J., ‘The Royal Navy and British Amphibious Operations during the Revolutionary and Napoleonic Wars’, *Military Affairs*, Vol. 52, No: 3, July, 1988, pp. 141-146.

Fleming Polk, J. F., “Vera Cruz, 1847”, in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, pp. 74-78.

Friend, B. and Gardiner, R., ”Amphibious Warfare vessels” in *Conway’s History Of The Ship: The Eclipse of the Big Gun: The Warship 1906-45*, London, 1992, pp. 140-150.

Ganz, A. H., ‘”Albion” – The Baltic Islands Operation’, in *Military Affairs*, Vol. 42, No. 2. 1977, pp. 91-97.

Gray, A. W., ‘Joint Logistics in the Pacific Theatre’, in *The Big ‘L’: American Logistics in World War II*, Washington, 1997, pp. 293-338.

Harding. R., “Sailors and Gentlemen of Parade: Some Professional and Technical Problems Concerning the Conduct of Combined Operations in the Eighteenth Century”, *The Historical Journal*, Vol. 32, No. 1, p. 35-55.

Horner, D., “The ANZAC contribution: Australia and New Zealand in the Pacific War”, in *The Pacific War: From Pearl Harbor to Hiroshima*, Oxford, 2006, pp. 143-158.

LeBlanc, R., *Pallet Evolved Along with Forklift*, article from www.palletenterprise.com

MacGregor, D., “The Use, Misuse, and Non-Use of History: The Royal Navy and the Operation Lessons of the First World War”, *The Journal of Military History*, Vol. 56, No. 4, Oct., 1992, p. 603-616.

MacGregor, J., “The Naked Truth of Battle”, *Military Affairs*, Vol. 11, No. 4, Winter, 1947, pp. 223-228.

Marder, A., ”The Influence of History on Sea Power: The Royal Navy and the Lessons of 1914-1918” in *The Pacific Historical Review*, Vol. 41, No. 4., Nov., 1972, p. 413-443.

Millett, A. R., “Assault from the Sea: The development of amphibious warfare between the wars: The American, British, and Japanese experiences”, in *Military Innovation in the Interwar Period*, New York, 2005, p. 50-95.

Murray, W., ‘Thinking about Revolutions in Military Affairs’, *JFQ*, Summer 1997, pp. 69-76.

Paige, “The Great Landing 1917” in the *International Journal of Naval History,* Vol. 1, No. 1, April, 2002, at www.ijnhonline.org

Saratakes, N. E., ‘The Short but Brilliant Life of The British Pacific Fleet’ *JFQ*, issue: 40, 1st Quarter, 2006, p. 85-91.

Sibley, R. J., “East Africa Fiasco at Tanga“ in *History Of The First World War Vol. 1*, Bristol, 1969, pp. 354-360.

Stephan, J.J., “The Crimean War in the Far East”, *Modern Asian Studies*, Vol. 3, No. 3, 1969, p. 257-277.

Stewart, R. A.,, ‘The Japanese Assault on Timor 1942’, *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, pp. 202-209.

Sweetman, J., “British Invasion of the Crimea, 1854”, in *Assault From The Sea: Essays on the History of Amphibious Warfare*, Annapolis, 1993, p. 79-87.

Williams, R. C., “Amphibious Scouts and Raiders”, in *Military Affairs*, Vol. 13, No. 3, Autumn, 1949, pp. 150-157.

Wise, T., “ Tsingtao”, in *History Of The First World War Vol. 1*, Bristol, 1969, pp. 320-329.

Yoshikichi, K., “Korean Guard”, p.115, in *Japan At War An Oral History*, London, 2000, pp. 113-120.

DVDs

Granada Television, *Warship: The history of War at Sea*, 2001.